బోధనాభ్యసన ప్రక్రియలు -
ప్రణాళికలు - మూల్యాంకన విధానం

D.Ed. - Maths

ఛాత్రోపాధ్యాయుల కరదీపిక

State Council of Educational
Research & Training
Hyderabad, A.P.

రూపొందించినవారు

Sri K. Rajender Reddy, Coordinator, S.C.E.R.T.
Sri K. Sridharacharyulu, S.A, Maths, G.P.V.P., Rangaipally, Tufran (Man), Medak Dt.
Sri N. Dharmender Singh, S.A, Maths, G.P.V.P., Bhannura, Bodh (Man), Adilabad Dt.
Sri T.V. Ramakumar, HM, Maths, G.P.V.P., Mulumudi, S.P.S.R., Nellur.
Dr. V. Sadanandam, Principal, Janagama College of Education, Kakatiya University, Warangal.
Sri P. Suresh Kumar, S.V., P. V.P, Vijayanagar Colony, Hyderabad.
Sri P. Laxman, J.R.P., I.A.N.E., Usmania University, Hyderabad.
Dr. B. Ella Reddy, Lecturer, I.A.N.E., S.V. University, Hyderabad.
Dr. Dharmateja, Academic I.A.N.E., Usmania University, Hyderabad.

విషయనిపుణులు, ఎడిటింగ్

Sri K. Rajender Reddy, Co-ordinator, ..., Textbook Division
S.C.E.R.T., Andhra Pradesh, Hyderabad

Dr. N. Upender Reddy, Professor, ..., Textbook Division
S.C.E.R.T., Andhra Pradesh, Hyderabad

సలహాదారులు

Prof. K. Sudheer Reddy, I.A.N.E. College, Osmania, University, Hyderabad.

Prof. N. Mahender Reddy, Chairman, Board of Studies, Kakatiya University,
Dean Faculty of Education, Satavahana University.

Prof. K. Sivaratnam Reddy, Head, I.A.N.E., Sri Venkateswara University, Tirupati

Prof. T. Nirmala Jyoti, Chairman, Board of Studies, Andhra University, Visakhapatnam

Prof. A. Ramakrishna, H.O.D., I.A.N.A., Osmania University, Hyderabad

ముఖ్య సలహాదారులు

Sri G. Gopal Reddy,
State Council of Educational Research & Training
Andhra Pradesh, Hyderabad

ముందుమాట

జాతి భవిష్యత్తు తరగతి గదిలో నిర్మాణమౌతుందని కొఠారిగారు చెప్పారు. అంటే పాఠశాలలు పిల్లల్ని జాతికి ఉపయోగపడే హేతుబద్ధమైన పౌరులుగా తయారుచేసే గురుతరమైన బాధ్యతను పోషించాల్సి ఉంటుంది. పిల్లలందరూ నాణ్యమైన విద్యను పొందడం నిర్బంధ ఉచిత విద్యాహక్కుచట్టం 2011 ప్రకారం పిల్లల హక్కుగా మారింది. పిల్లలు ఆలోచించగలగడం, వ్యక్తీకరించగలగడం, విచక్షణతో వ్యవహరించగలగడం, సబ్జెక్టువారీగా, తరగతివారీగా నిర్ధారించిన సామర్థ్యాలను సాధించగలగడం వంటివి నాణ్యమైన విద్యలో ముఖ్యమైన అంశాలు. వీటిని పొందేలా చేయడం పాఠశాలల బాధ్యత. వీటిని సాధించేలా చేయాల్సింది ఉపాధ్యాయులు.

విద్య వ్యాపారాత్మకమైన నేటి పరిస్థితుల్లో పాఠశాలలు తమ బాధ్యతను నిర్వర్తించడం, ఇందుకనుగుణంగా ఉపాధ్యాయులు తమ విధులను నెరవేర్చడంలో అనేక సవాళ్ళను ఎదుర్కొనేలా ఉపాధ్యాయులు మారాల్సి ఉంటుంది. సమాచారాన్నే జ్ఞానంగా భావించడం, ఈ సమాచారాన్నే పిల్లలకు అందించడం లేదా అర్థం చేయించడమే బోధనకు పరమావధిగా భావించడం, వీటిని జ్ఞాపకం పెట్టుకోవడాన్ని పరీక్షించడమే పరీక్షల ముఖ్య ఉద్దేశంగా మారడం వంటి పరిస్థితుల నుండి నూతన దృక్పథంతో ఆలోచించి ఉపాధ్యాయులు తమనుతాము మార్చుకోవాలి. పాఠశాల వ్యవస్థను మార్చగలగాలి. వీటిని సాకారంచేసే దిశగా ఉపాధ్యాయ విద్య ఎప్పటికప్పుడు ఆధునీకరించబడాలి.

ఈ నేపథ్యంలో మన రాష్ట్రంలో జాతీయ విద్యా ప్రణాళిక చట్రం 2005, RTE-2009 ఆధారంగా రాష్ట్ర విద్యాప్రణాళిక పరిధిపత్రం - 2011ను రూపొందించారు. పిల్లలు అర్థవంతంగా నేర్చుకోవాలని, పిల్లలు జ్ఞాననిర్మాతలని, తాము పొందిన జ్ఞానాన్ని దైనందిన జీవితంలో వినియోగించగలగాలని, నేర్చుకోవడం అనేది పాఠ్యపుస్తకాలకూ తరగతిగదికే పరిమితం కారాదని అన్వేషణలు, ప్రయోగాలు, ప్రాజెక్టుపనులు, ప్రతిచర్యలతో కూడిన బోధనాభ్యసన ప్రక్రియలుండాలని, ఇందుకనుగుణంగా విమర్శనాత్మక బోధనా పద్ధతులు, సామాజిక నిర్మాణాత్మక వాదానికి చెందిన బోధనా పద్ధతులు వినియోగించాలని, పిల్లల సామర్థ్యాలను ఆలోచనా నైపుణ్యాలను ఎప్పటికప్పుడు అంచనావేసేలా నిరంతర సమగ్ర మూల్యాంకన విధానాలు అమలు జరగాలని APSCF-2011 లోని కీలక సూత్రాలు తెలుపుతున్నాయి. వీటి ఆధారంగా మన రాష్ట్రంలో ఒకటి నుండి 10వ తరగతి వరకు పాఠ్యప్రణాళికలు, పాఠ్యపుస్తకాలు, మూల్యాంకనా విధానాలను ఆధునీకరించారు. రాష్ట్ర విద్య పరిశోధన శిక్షణ సంస్థ వీటిని రూపొందించింది.

ఉపాధ్యాయ వృత్తిలో ప్రవేశించే వృత్తిపూర్వక ఉపాధ్యాయ శిక్షణను నిర్వహించే ఉపాధ్యాయ విద్యా సంస్థలు, శిక్షణా సంస్థలు వీటిని ఆకళింపుచేసుకొని ఛాత్రోపాధ్యాయులను తయారుచేయాలి. నూతన పాఠ్యపుస్తకాలపైన, ఆధునిక బోధనా విధానాలపైన, మూల్యాంకన విధానాలపైన, తమ శిక్షణార్థులకు శిక్షణ ఇవ్వవలసి ఉంటుంది. ప్రధానంగా నూతన పాఠ్యపుస్తకాలకు అనుగుణంగా జ్ఞాన నిర్మాణం జరగడానికి వీలుగా ఆధునిక బోధనాపద్ధతులతో కూడిన ప్రణాళికలను రూపొందించుకునేలా శిక్షణ ఇవ్వాలి. ఇందుకోసం విశ్వవిద్యాలయాల్లోని విద్యావిభాగాల వారు రాష్ట్ర విద్య పరిశోధన శిక్షణ సంస్థ (SCERT) లోని విద్యావిభాగంతో కలిసి పనిచేయడానికి ముందుకు రావడం, ఈ మార్పులను స్వాగతించడం శుభపరిణామం. విశ్వవిద్యాలయాల్లోని ఆచార్య బృందం, SCERT విద్యా ప్రణాళిక విభాగంలోని సభ్యులు కలిసి ఛాత్రోపాధ్యాయులకు ఉపయోగపడే విధంగా బోధనాభ్యసన ప్రక్రియలు, ప్రణాళికలు, మూల్యాంకన విధానాలు అనే కరదీపికను ఛాత్రోపాధ్యాయుల కోసం రూపొందించారు. ఈ కరదీపికలో APSCF పరిధిపత్రం సంక్షిప్తసారాంశం, RTE-2009 చట్టం, జ్ఞానం-జ్ఞాననిర్మాణం-తరగతి గది అన్వయం, నూతన గణిత పాఠ్యపుస్తకాల ప్రత్యేకతలు, కీలకసూత్రాలు, గణితాభ్యసన వ్యూహాలు-బోధనాసోపానాలు, వార్షిక పాఠ్యప్రణాళిక, పీరియడ్ ప్రణాళికలు, నిరంతర సమగ్రమూల్యాంకనం, బోధనాభ్యాసం మార్గదర్శకాలు, సి.సి.ఇ. రికార్డు మార్గదర్శకాలు మొదలగు అధ్యాయాలు చేర్చారు. కరదీపికలో చివర గణితోపాధ్యాయులకు ఉపయోగపడే రెఫరెన్స్ పుస్తకాల వివరాలు, వెబ్‌సైట్ల వివరాలను కూడా పొందుపరిచారు.

ఛాత్రోపాధ్యాయుడు ఈ కరదీపికలోని అంశాల ఆధారంగా బోధననాభ్యాసం సందర్భంగా రాసే వార్షిక, పాఠ్య, పీరియడ్ ప్రణాళికలను ఆధునిక విధానాలకు అనుగుణంగా, రాయగల్గుతారు. అట్లే SAT రికార్డును నిరంతర సమగ్ర మూల్యాంకనానికి అనుగుణంగా మార్చి రాయగల్గుతారు.

ఉపాధ్యాయులు నిరంతర అభ్యాసకుల. పరిశోధనా దృక్పథంతో పనిచేయాల్సి ఉంటుంది. అవసరాలకనుగుణంగా తమనుతాము మార్చుకొని ఫలితాలను సాధించే వ్యక్తులుగా నూతన పాత్రలు పోషించాల్సి ఉంటుంది. ఈ వాస్తవాలను అర్థంచేసుకొని భవిష్యత్ తరాలను తీర్చిదిద్దే ఉత్తమ ఉపాధ్యాయులుగా ఎదగడానికి కృషిచేస్తారని ఆశిస్తున్నాం.

దీని రూపకల్పనలో పాల్గొన్న SCERT లోని విద్యాప్రణాళికా విభాగ సభ్యులకు, పాఠ్యపుస్తక రచయితలకు, స్టేట్ రిసోర్సు గ్రూప్ సభ్యులకు, ఉస్మానియా, కాకతీయ, వెంకటేశ్వర, ఆంధ్ర విశ్వవిద్యాలయాల ఆచార్య బృందానికి అభినందనలు. భవిష్యత్తులో ఇదే విధంగా విశ్వవిద్యాలయాలు, SCERT తో కలిసి విద్యాభివృద్ధికోసం కృషిచేస్తాయని ఆశిస్తున్నాం.

సంచాలకులు
రాష్ట్ర విద్య, పరిశోధన, శిక్షణ సంస్థ,
ఆంధ్రప్రదేశ్.

తేది : 31-05-2014
స్థలం : హైదరాబాదు

INDEX

RTE-2009 : Qualities Provisions

Context :

Geographically India is a vast and enormous country. Demographically it is also a second largest country of the world. It is a country, where we can find "unity in diversity". Here, one can find the people belongs to various cultures, traditions, religious, castes, tribes, creeds and communities, live together. It is eminent for its richness of its cultures and traditions. In its great past, India was considered as one of the poised (eminent) centres of higher learning. Thaksha shila was the earliest recorded centre of the higher learning in India from 5th Century BCE and Nalanda University was the oldest university-system of education in world in the modern sense of university. Thus, India had shown the height of wisdom to the entire world. But thereafter, when we analyse the development of the people and the education system of India we observe that it has been loosing its past glory. Even after six decades of its independence, 100% literacy of India became a sourgrape. After the independence, with great foresight, the designers of constitution of India had believed that the future of the nation depends upon the development of system of education and accordingly they constituted in "the directional principles to provide education for all the children of the Nation. Consequently we have observed some of the developmental activities taken place in the field of education by implementing various literacy programmes in our country. Although, our schools are ineffective in providing free and encouraging environment in admitting the children of school age, retaining the admitted and providing them ample opportunities to learn meaningfully to apply the learned concepts in their

daily life. There is no clarity on the issues like what the children are expected to achieve after completion of education leads to unrest, as the education is being provided to rich is richer and poor is becoming poorer. The unnecessory information that is loaded in the text books, the methods of examinations that are resulted in stress and tension, the working condition / attitudes that are seperating the school from the society, and lack of answerable nature or accountability among the learners and society etc. are deviding the entire education system.

In this regard, Professor, Yashpal Committee (2003) had submitted a report on "Learning without burden" to the government of India by sensitivly criticising the existing erratic and unpractical , unscientific ways of education system. Based on this report, a National Curriculum Frame Work-2005 is being prepared by NCERT. The programmes which were taken place after 1986 in the country, and their fruits like OBB, APPEP, DPEP and SSA eta, are expressed by NCF-2005 as an official report. NCF-2005 has rightly pointed out that the learning must be taken place meaningfully by discouraging the methods of rote memorization, the children has to apply the knowledge that acquired, in their day to day life. The information and knowledge are not to be considered as same alike. Knowledge must be constructed by the learners based on their personal experiences, reflective thinking, and analysis, and the evaluation methods are to be reformed to avoid unnecessary stress and tension among the learners. It also propounded the need to bring the reforms in education system and development of school education which is possible only with the participation of society.

The NCF-2005 has also made recommendations on textbooks. Accordingly, the text books should be useful to the learner to develop his/her thinking and should help him to learn from his own experiences. The teaching learning activities must increase the level participation of the learners and help them to construct their own knowledge. Considering the guidelines of NCF-2005 and recognising the issues that hinder the admission process of child labour into regular schools, the Government of India had introduced a bill in the parliament in the month of August, 2009 which made education as a fundamental right. That bill, on August 26, 2009 was approved by the President of India. Then, the Government of India, consituted it as "Right to Education Act - 2009" on 27th August, 2009 and released it through the Gazette.

Right to Education Act (RTE) - 2009

RTE-2009 has come into force on 1st April, 2010. This is the act, which was come into force by the Prime Ministers speech intended for the nation, in entire history of the country. In his message, the Prime Minister of India has said that "All the children of this country, irrespective of their caste, cread and relegion can join the schools and acquire quality education under this

Act, which provides education as a Fundamental Right. To grow as a responsible citizens, the required knowledge, skills, attitudes and values are imparted through the quality of education".

This quay is historical. Our country is also joined in the list of countries which made education as a fundamental right. In particular, the children under the age group of 6-14 years have acquired the right to quality education. To provide quality education for all the children, the issues like establishment of required number of schools, the responsibilities of governments, responsibility of schools, responsibilities of teachers, rules and regulations of the schools and academic standards are clearly addressed in this act. Especially, we can identify two main provisions of this act. The first one is about the provisions of qualitative, administrative and implementation, and the second is about the provisions of understanding the need of quality education, and provisions of curriculum. Implementation the act refers to the implementation of all aspects of the act and are brought into practice. That means, all the children must be admitted in the schools, they are going to continue their studies to acquire quality education. For that sake, all the necessary actions must be taken, time-to-time, and achieve good results.

Sections in the act and their details :

The RTE-2009 consists of different chapters, and sections. Let us have a look into them.

- This act consists of 7 chapters, 38 sections and one schedule.
- In begnning, the dates of introducing the bill in the parliament, the dates of approval by the President of India, its implementation, scopes and details are given.
- **Chapter-1 :** In this chapter, the details of name of the act, its scope, implementaiton, and the intended meaning of different words used in this act and definitions are given.

  Ex : School, children, primary educaiton selection procedures etc., are explained clearly. All these details are provided under 1 to 3 sections.
- **Chapter-2 :** The provisions like free and compulsory education as a fundamental right, admission procedures in to school, transfer certificate etc., are constituted under 4 and 5 sections.
- **Chapter-3 :** Under the sections 6 to 11, it is communicated the details of the responsibilities of the central, state governments and local bodies, and parents. The establishment of preprimary schools are also notified under these sections.

- **Chapter-4 :** The details of the responsibilities of teachers and schools are propounded under the sections 12 to 28. In particular, when the child is admitted in the schools he should not under go any sort of selection methods and capitation fee of any type, should not be collected. The child can be admitted without any certificates they cannot be continued in the same class repeatedly and they can not be removed from the school. The issues of corporal punishment like, phisical and psychological harasment, physical and mental abusement of the children are punishable affenses and are clearly addressed. These are clear explanation on the establishment of new schools, and the standards to be followed, rules and regulations, recruitment of teachers, their duties and responsibilities etc.
- **Chapter-5 :** Section 29, and 30 particularly explains about the educational plans related to quality education, curriculum and evaluation procedures etc. There is a special recommendations, to be kept in mind, to consider the all round development of the learner, constitutional values while determining the educational programmes and evaluation methods. Along with these, the teaching - learning activities, examination system, mediums of teaching and learning environment etc., are also commented.
- **Chpater-6 :** The explanation of protection of child rights, supervision, grievance readdressal system, and advisory ammittees at state and national level are given under sections 31 to 34.
- **Chapter-7 :** The authorities to issue orders on implementation of the act, procecution, actions to be taken and framing the rules and regulations etc., are discussed under section 35 to 38.
- At the end of the act, it is mentioned in the annexer's schedule, the details about the standards of school and regulations are explained keeping in the view of section 19 and 25. Among these details, the student teacher ratio to be followed, school buildings, classrooms, hostel facilities, basic infrastructure and equipment, total working days of the school in entire academic year, the number of teaching hours, the number of working hours of teachers for week etc., are clearly mentioned.

Chapter-5 : Curiculum, Reforms in Evaluation and Completion of Primary Education

29(1) : An academic organisation which is authorised by a notification given by a respective government, will determine the curriculum and evaluation methods. According to section (2),

subsection (1). While determining the curriculum and evaluation procedure, the authorised academic organisation will consider the following items :-

The curriculum and evaluation procedure must :

(a) be according to the values that are provided by the Indian constitution

(b) be resulted in alround development of the learner

(c) develop the skills, abilities and knowledge of the children

(d) develop the physical and phychological powers up to the maximum level of the children's ability.

(e) by taking the children as a centre and according to their convinient methods, all the educational programmes, research and findings etc. are must be developed. The children must learn through the child centred approaches and activity based methods.

(f) As much as possible, the medium of instruction should be the mother tongue of the children.

(g) Children should be freed from fear and anxiety and help them to express their views in a free and friendly environment.

(h) Continues Comprehensive Evaluation (CCE) should be taken place to evaluate the way that the child understand the knowledge and the abilities of applying the knowledge.

Primary Education Test Completion Certificate :

30(1) There is no need to appear in any board examination by the children until they complete their primary education.

(2) After completion of the primary education, the boy or girl, will be issued a certificate according to their suitable methods, as per the guidelines.

Let us know the above issues with more clearity !

RTE-2009 - Child Development :

'Development' is a right of the children. Right to be live, Right to be protected, Right to portership, and Right to the Development are very important child rights and they are applicable for all the children in the entire world. All the nations are declared that they will take necessary actions for the development of children, in various international stages.

The nutritious food to live, drinking water, healthy and hygenic sorroundings and environment, safety, affective and conducive environment and curricular, co-curricular activities

which leads to the alround development of the children, are some of the child rights. If all these happens properly then the development of the children will be achieved. All these child rights are interedependent, so, one must understand the all round development of a child, in the view of child rights.

The achievement of all round development of the children is constituted as an act in our country by the Right to Education Act - 2009. In this act, under section 29, subsection 2, it is clearly mentioned that all the educational planning, curriculum, textbooks and evaluation procedures of education should lead to the allround development among the children.

For the all round development of the children, while preparing the educational planning, curriculum and evaluation procedures, the Academic Authority has to keep the following views in mind, as recommended by the RTE-2009. They are :

- The values which are constitutionally provided.
  Ex : Equality, freedom, social, secular and democratic etc.
- All round development of the children.
- Development of knowledge, skills, attitudes and abilities of the children.
- Development of physical and psychological powers to the maximum extent of their abilities.

School is a centre which is established for the all round development of the children. The aim of education cannot be achieved by developing a particular ability of the child or bounded to a particular issue. But the integrated development among the children is possible only by identifying the areas of interests, desires of the children and developing such areas, make them to participate in such areas and conducting various programmes that are required in the schools.

'Childhood' is the stage which help the child to grow more. At this particular stage, if the school environment and working condition, detract their childhood, then it will lead to hinder their progress. Hence, various programmes should be planned and conducted in all required domains which in return, lead to the all round development of the children. For that sake, the following domains are to be kept in mind.

They are :

- Physical and psychological development.
- Social development.
- Emotional development.

- Development of moral and ethical values.
- Development of aesthetic sense.

Development of children's knowledge, abilities, skills, values and attitudes to the fullest extent :

The development of physical, psychological, social, moral, intellectual, emotional, and aesthetic sense among the children is called as the all round development. This all round development is brought in the child only when he/she learns with interest and ease, take part in teaching-learning activities that create fearless environment, to the child. Thus, the education, which provides such free and learner friendly environment and helps the child to lead a good lifestyle and become a responsible and and rational citizen, is the real education. Accordingly, the school programmes are to be designed to nurture the physical and psychological development of the child. Also, the teaching-learning activities are conducted to bringout the inherent talents and abilities of the child.

1. Knowledge for the children :

Knowledge is not merely the information. It is not that content which is mugged up from the guides and question banks and answered back. It is not that write up which is copied the answers from the textbooks, guides and study materials for the given questions. Knowledge is that which is emerged from the thoughts that is based on one's past experiences. It may be a comprehension of a concepts, solving a problem or generating a formula from the generalisation. Knowledge does not exist in the same form in all the subjects and contexts. It varies according to the nature of the subject. In languages, it may be in the form of writing stories, wirting the experiences, developing slogans, writing poetry, lyrics etc. In mathematics, it exists in the form of relations, principles and proofs, in sciences, it takes the form of facts, formulae, principles, theorems, and generalizations. In social sciences, the knowledge is requires the form of identifying the issues that affect the human life, generation of values, acts and customs of the society, etc. Thus one must feel that, if construction of knowledge takes place, then learning will happen. Knowledge construction cannot be happened only through the meaning less methods of lecturing, reading, explaining, rote memorisation or cramming. But, it can be constructed by meaningful ways of conducting child centred teaching - learning activities like projects, explorations, and inferances.

Thus, knowldge is not the acquisition of information. It is the combination of thoughts and perceptions. We have been misguided as the child who acquires information through the

methods of cramming, recaptulation, and memorisation, as the knowledge. But knowledge is some thing different from our assumptions. It is not transmitted information to the child but it is self constructed by ones own experiences. For that the child has to actively participate in observing and doing the things by themself in construction of knowledge. By habituating the children to cram the content and ask them to answer the questions as it is mugged up. We cannot make him educated. But, the learning should be based on the collection of facts, analysis and generalisation of that facts. Such learning should be encouraged among the children in the schools.

1. **Factual Knowledge :** Truths, statements, definitions, information and vocabulary.
2. **Conceptual Knowledge :** Various facts and information about the facts.
3. **Procedural Knowledge :** Rules, regulations, different methods, and constructing the knowledge.
4. **Meta Cognition :** Self understanding, comprehending how and what we are learning? etc.

According to B.S. Blooms if we have knowledge on a particular concept then we are able to compare, recall, explain in our own words, drawing a figure, identify the parts, and also able to write after understanding it, record the observations, interpretate the results and recaptulate them etc.

If knowledge exists then one can do the following.

- Understanding
- Application
- Analysis
- Synthesis
- Evaluation and - creation.

2. Compitencies / Abilities of the Children :

Competency is the ability to act, having the capacity. Everybody can "talk" but the ability is to get the required information from others by asking them. Although, every one knows writing but writing an application for ones own need is the ability. So, in this context one should understand the competencies or abilities. The knowledge which is acquired up to the level of skillful performance is considered as an ability. Generally, abilities will be according to the nature of the subject. These are psychological. In school level, the children learns different

subjects. Indeed deciding what the children has to achieve? What to perform? by learning these subjects, is very important. Therefore, the abilities, to be achieved, are determined by the nature of various subjects in different classes. So, it our responsibility to look after the children to attain them. Accordingly, new textbooks have to be bought and utilized in a proper manner. That means, we need to look after that the children has to solve the excercises, that are based on the abiities, given at the end of the lessons, by themselves. Prohibit the habit of copying from the guides and qustion banks, which hinders the development of abilities among the children. They will develop the competencies by thinking, try outs, and by studying. And also, by participating, and writing on their own etc., In this regard, the teachers are required to conduct the teaching - learning activities by preparing the year plan, and lesson plans well in advance.

Every child has his own inherent talents, and abilities. So, the chief aim of education is to bring out these innate powers and inherent abilities and to develop them.

The innate abilities of the children :

These innate abilities are exist in every child. They will be developed in different children in different ways. So, the important duty of the school is the complete development of these powers, capabilities and competencies and prepare them as a good citizens. Such innate abilities are :

- Thinking
- Observing comparing and collecting.
- Prediction
- Identifying the differences and saying
- Classifying and computing
- Estimating, or assessing
- Cause and effect, formulation
- Questioning, forming hypothesis
- Giving reasons
- Establishing rules and generalising
- Analysing
- Synthesizing
- Creating / producing
- Playing, singing, acting

- Expressing creatively
- Problem solving
- Concluding
- Manipulating the equipment
- Visualizing, and mind mapping
- Drawing figures, and shapes.

All these above said competencies will be exist in every child, upto some extent. But developing them upto maximum extent is the responsibility of the schools and teachers. So, teachers have to plan and conduct suitable programmes for the growth and development of these abilities, as a part and parcel of their subjects.

3. Skills

Skills are the abilities that the child has to perform to face the new challenges in the competitive world. These may be subject based or implicit in all the subjects.

The skills are basically in the following ways :

1. Thinking skills
2. Social skills
3. Communicative skills
4. Self management skills
5. Research skills

i) **Thinking Skills** : Generally, we may have some exposure to language skills, processing skills and classification skills in science, comparing, experimenting, communication skills, formulating hypothesis, inventions, and concluding etc. Basically skills are psychological i.e. thinkable. Thinking skills are the skills of exhibiting variety in the ways of thinking. Primarily, they are of four kinds.

1. ***Reflective thinking***
2. ***Analytical thinking*** that means, giving the reasons by identifying the reality.
3. ***Dialectical thinking*** i.e. thinking and analysing from different angles of the issue. Or explain a particular topic from different angles, i.e. supportingly and at the same time differing with it.

   Ex : To talk aboaut the methods of finding areas of diferent shapes and their advantages, and talk about their interrelationship.

4. ***Creative thinking*** to propose newly, creating new things, expressing own decisions confidently, clearly and with stability.

5. ***Critical thinking :*** Thinking by questioning to know how ? why ? what ? etc.

Learning takes place through proper thinking. To make students to learn, they are made to think on their concepts and problems. The knowledge construction develops on the basis of thinking, acting or performing and experiencing. Think to acquire knowledge through thinking. The understanding, application, analysis, synthesis and evaluation like higher order skills will be achieved.

ii) Social Skills :

- Respecting others.
- Accepting the responsibilities.
- Sharing and working with others.
- Performing the personal duties among the group & society.
- Self confidence, faith on self.
- Family life and wish to have family relations.
- Proper utilisation of resources available in the sorroundings.
- Ability to solve the problems occuring in daily life.

iii) Communicative Skills :

- Listening carefully, sound listening.
- Think before talking
- Reading
- Responding after complete comprehension of the read.
- Applying the mathematical langauge and symbolism effectively.
- Converting the real life problems into mathematical language.
- Explaining the logic in achieving the solution to a problem and comprehending the concepts.
- Giving reasons and explain the methods of problem solving.

iv) Self Management Skills :

- Psycho motor skills (working with fingures, hands and limbs)
- Time management

- Healthy life style
- Desirable behaviour of the children.

v) Research Skills / Information Skills :

To know by researching and acquaint with different skills. They are :

- Questioning
- Observing by questioning
- Planning and collecting information
- Recording and analysing the collected data
- Report writing on the findings and exhibiting

Till the above said skills are to be developed by all the schools through various curricular & co-curricular programmes.

4. Attitudes (Dispositions)

Attitudes are the exposure and disposition of manners, human values, beliefs, and feelings etc, with regard to ones nature and community.

The important attitudes that are exhibited most often :

- Accepting responsibilities
- Co-operation
- Creativity
- Curiosity and activeness
- Empathy
- Tolerence and patience
- Show respect
- Independency
- Love and affection, forgiving nature
- Encouraging and appreciation.
- Honesty and dignity of labour.

It is education by which the development of community and nation is to be achieved. Thus, the schools have to facilitate the alround development of the children by recognise and developing the innate powers. And psychological, physical, emotional, ethical, values and principles.

Promoting learning through explorations, discovery in a child friendly and child centered ways

What is learning ?

"Learning" is being assumed as delivering lecture to the students and retriwing the given information by question. Because of such practice in schools, the teachers are just providing information to the students and the students are listening to memorise. But, in reality, learning means converting the acquired information, by understanding it into experience. Applying such knowledge when ever it is necessary. But there is no availability of such kind of methods which prevent the children from cramming.

Modern educational researches have proved that children have the power of learning and they can construct their own knowledge. So, the teachers responsibility is to guide and facilitate the children to construct their own knowledge from the previous knowledge and past experiences.

Teachers are treated as knowledge donators and students are knowledge receivers as it believed upto now. But, it is not true. The learners are the knowledge makers but not the mechanical devices which run on the commands of the master.

Thus, from the above discussion, we can understand the learning is the power of applying the knowledge that is well understood and constructed from the past experiences and previous knowledge.

Nature of learning - how children learn ?

- Childrens learns not only through reading and listening but also form the other ways like experiencing, learning by doing, experimentation, discussion, questinings, thinking, responding or refleting and expressing oneself.
- Active learning is natural in the children. Every child can learn. They have such ability. Learning can be happen not only in the school but also the outside world. To improve the learning, it is necessary to link or relate the classroom learning with the activities out side the school and experiences in home, sports field and among the peers. Learning will be effective by doing, thinking and observation.
- Learning takes place effectively by grasping the meaning, understanding, logically thinking, problem-solving, exploring, finding, and discussing etc.
- Learning won't take place if send the children to the school even if they are mentally, physically, psychologically ready. If it happens then they learn only through cramming,

they cannot digest the concepts and they cannot imply that knowledge to their day to day life. They regret to learn if they do not have proper idea about the concept that was taught in the school and if they donot have required abilities. Thus, they feel, the concept, as difficult. So, it is our responsibility make them intellectually prepared.

- For effective learning the children are asked to think by posing some questions. They are made to speak on the activities, problems, projects, that are given to them. They should generate reports on what they have learned. Doing like this way, the children learns happily and actively. Such activities have variety and challenge and avoid the boredom. They will learn by doing themselves and can contentrade on their work. When the children feel pleanne to do the things learning takes place monthly and they will be involved. Problems of indisciplene and do not arise and reduces the notorious behaviour.
- Learning takes place by the mutual reactions, observations and mutual interaction with the people, and environment and society.
- Children try to acquire new knowledge based on the existing. The construction of knowledge happens in the child through personal interactions with environment, people and community. The previous knowledge will vary from child to child. Accrodingly, understanding abilities are also vary. So, the children never be alike in learning.
- It is very important to provide, for effective learning, the fearless classroom environment. Children learn actively when they are provided the safty, love and affection. When teachers mingle with them while learning, teaches them individually, and encourages them to ask the unknown issues freely, the child will learn more effectively.
- The classroom environment should be clean. Black boards and charts are being used while teaching. Discuss, frequently about the content related issues and the children should be asked to express their views on their own. Write the important questions on the board and ask the children to answer. They also learn by listening to others responses. Such a way, a social environment will take place in the school. It is called as the 'interactive learning'. Through this method children will get an opportunity to express their views in a fearless and friendly environment. They participate actively in all teaching - learning activities.
- While learning, children may commit mistakes. So, there is no need to insult them, highlighting their mistakes, punish them and compare them with other fellow beings. Instead, we need to identify the merits of their performances and appreciate them. Discuss, the mistakes, that they made in a tree and friendly environment and make

them to realise from their mistakes. For every mistake, they made, if we criticise or to put 'x' marks and scolding them, they will hesitate to come up with the doubts that thegget and feel interior, scares, to ask us and donot come forward to ask their doubts. It results, a vaccum in their learning.

Collaborative Learning

'Learning' is a social process. Children learns by observation, directly or indirectly, while talking to people, while discussing and working with the group. It may happen incidentally. But, inigeneral, elders and parents feel that children learn only by their instructions. When we observe the things like, what to tell to the children? Whether they learn only from you? They know only what we have explained or told? How come they know the other things? Then we understand that how the learning occur in a child. They learn more by playing with their friends, singing, dancing, chating, discussing, arguing, working together etc. By discussing with others they expand their knowledge. Such co-operative or collaborative learning helps to develop participatory learning.

How do children leearn ?

Thinking is the basis of learning. According to the researches of educationists, learning ability lies inherent among the children. It will come by birth. Children learn through the environment, by interacting with the things, peers and the elders. They construct new knowledge based on the previous knowledge and by participating in the meaningful activities that are provided by the teachers in the school, according to the need. Now, let us see the processes which plays an in important role in childrens' learning.

They are :

- Thinking
- Observing
- Questioning
- Becoming partners
- Mutual interactions
- Continuous exploration
- Finding, searching
- Discussing
- Sharing their views and feelings with others.

- Participating in the physical and intellectual activities.
- Visiting etc.

Definitions :

Activity - 1 :

Ex : Finding the ratio of your cycle gares.

Count the teeth of the chain wheel and the teeth of the sprocket wheel.

Find the no. of teeth of chainwheel. The no. of teeth of the sprocket wheel.

It is called as the raio of gares. Now record, by observing the no. of times the back wheel rotated, in your notebook.

Activity - 2 :

Fill in the blanks by observing the following arrangement of numbers.

$1^2 + 2^2 + 2^2 = 3^2$

$2^2 + 3^2 + 6^2 = 7^2$

$3^2 + 4^2 + 12^2 = 13^2$

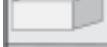
$4^2 + 5^2 + (\quad)^2 = 21^2$

$5^2 + (\quad)^2 + 30^2 = (\quad)^2$

$6^2 + 7^2 + (\quad)^2 = (\quad)^2$

Activity - 3 :

Observe the following table and fill in the boxes.

Objects	Name of the Object	No. of Surfaces (F)	No. of Vertices (V)	No. of Edges (E)	F+V	E+2
	Cube	6	8	12	6 + 8 = 14	12 + 2 = 14
	Cuboid					
	Pentagonal Prism					
	Pyramid Prism with four faced					
	Pentagonal Pyramid					

Till today, there are different openions among the teachers about the activities viz.

Ex :
- Activity is only physical. There is no relation between activity with teaching - learning process.
- Activities are useful to only 1 & 2 classes. There is no use of activities in the higher classes.
- Activities are based on predetermined objectives, methods and results.
- It is not possible to complete the syllabus with the time by these activity based methods.

But all these openions are misgiven.

Characteristics of Activities :

The desirable learning among the children will takes place meaningfully and fastly, if the activity possess the following specifi characteristics.

It should

- develop thinking
- challenging to the child's abilities
- be done by self, with group and with the co-operation of entire class
- be useful for multiple class teaching
- be according to the level of the learner
- be objective and practical
- be interesting and encouraging to participate
- be flexible to change and modify
- be of low cost or no cost.

In the classroom, the activities should be designed well in advance, and according to the interests, optitudes, tasks, feelings, likes and dislikes of the children and background of the lessons.

These activities should be given individually, with group work, and entire class work. Before providing the activities, all the instructions to be followed to participate in the activity should be clearly explained personal observation should be these while the children participating in the activities. Make sure that all the children to participate. Teacher should help them whenever it is necessary. Access their way of learning. Discuss the concepts which

are learned by the students, with them. Teacher should record all the responses of children in his diaries.

Activity - 4 :

Encourage the children to find the formula by themselves by doing the activity instead of directly teaching them.

Ex : Finding the formula for total surface area of a cuboid.

In finding this formula, the children will observe different cuboidal shaped objects and analyse whether their imagination is correct. Thus, the above formula of total surface area of a cuboid will be found by the students by themselves through preparing some note, shapes, and by doing the other activities based on their previous experiences. Finally they will desive the formula.

Discovery :

Discovery based learning double, the curiosity among the learners. They actively participate as it looks challenging. The feeling of inventions or finding the new formulae give them some more potentiality and make them to learn effectively and with ease. It leads to meaningful learning. By this method the learners percept themselves as young scientists.

Discovery learning :

Ex : Identify the concepts which provide an opportunity to the learner to search and discover the facts, formulae and learn by themselves. If such concepts/activities are not available, then try to modify the existing content, suitable for such discoveries. Record all the ways of participation of children in a diary and appreciate the children those who perform creatively.

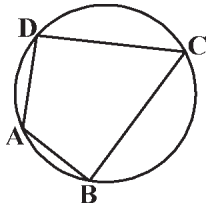
Activity :

- The volume of various 3D (Three diamensional) objects, is measured in cubic units. Why?
- How to find the volume of cuboid, cube, triangular prism, pyramic and a cylinder ?

Explorative survey :

Activity - 6 :

In following figure, the vertices of a quadrilateral are given on a circle. Draw any three ABCD quadrilaterals of the same type and measure their angles and fill the boxes given in the table.



S.No.	∠A	∠B	∠C	∠D	∠A+∠C	∠B+∠D
1						
2						
3						
4						
5						

From the above table what can you conclude ?

This type of activities raise 'the curiosity to know' among the learners. They will scarch the required information in different angles. Then they will come to some generalisation. Finally they will fix to their openions. The teachers responsibility here is to bringout the required information from the children by asking critically & analysing questions. By such activities children feel themself they find the information. They can apply the knowledge that acquired from the text book, and develop their abilities.

Learning through exploration :

- Learning should child centered.
- Children findout new topics curiously by searching different issues in their sorroundings, their day to day life experiences.
- Children should not learn from teaching. They should find themself or understand the concepts through boservation and by doing things.
- Students construct their own comprehension through discovering or experiences of finding new things.
- At the same time, they also develop some other important skills and attitudes.
- Teachers should co-operate the children by incouraging their explorations and suggest the ways to find meaningfully.
- Self exploration leads to motivation among the learners. All the findging should belong to the learning objectives. It is possible only when providing specific resources, challenging tasks, and questioning that helps to achieve the learning objectives.

- Teachers has to provide the tasks according to the ability of a child. If they provide the task as they wish to performed by the learner, the child may loose freedom of thinking and finding new objects. Their creativity will be controlled and bounded.
- When the child determines and tries to search for the new things and explorations. Then, obviously, he/she will participate in the activities and learn with enthusiasm. They will get complete control over their learning. They will develop their understanding, skills and attitudes according to their needs and experiences. They will learn by writing the lesson, through activities, discoveries, and explorations.

Examples of Discovery :

1. What is the chord of a circle ?
2. How does the diameter of a circle form ?
3. How to make a semi-circle ?

Child Centered Education :

Education should be centered by the learner. That is, it has to give much priority to the experiences, thoughts, and active participation of the child. So, the teacher has to plan the teaching learning process by keeping the development of children, their interests, and desires in view. These teaching-learning activities must give priority to the variety and physical, psychological, cultural and social importances of the child. The activities should give importance to the feelings, openions of the child. Teacher should act as a guide, friend, philospher and a facilitator to the child in his learning.

Understanding Childhood :

- In general, children, shows much curiosity to know about each and every object and every existence in this universe. This curiosity will be common among all the learners. We need to develop and continue this curiocity throughout his learning.
- Children are energitic, they are not stable. They cannot sit ideal in a particular place. They always do something or the other. They play, sing, dance and talk, because they are of full energitic and curious. We try to utilise all these abilities, efficiently, in learning. We should not force them to do the challenging tasks. It may resulted in culture of silence and idealness.

Children has a great sociability :

Children, usually, like to work with others. They wish to be with their elders in all occasions like functions, festivals, etc. They will try to do the things with their parents and

elders. By using this participating nature, we have to develop social skills among the children, like working with groups, doing projects and activities along with the class and peers etc.

Children wish to get encouragement and appreciation :

Children learn actively by encouragement and appreciation. They will try to learn more and habituate good behaviour. They wish to be get noticed and their works are to be appreciated. Basically learning happens with encouragement and appreciation. Punishment and fear kills their curiocity and hinder their learning. They will try to escape from such discouraging environment.

Children do not like punishment, criticism and punishment :

Children should learn with happyness and pleasure. Development of children will be more in free and stress free environment. They feel happy and pleasure when their openions and aptitudes are given importance. So, we have to create such free and friendly environment in the classroom and provide child curtered teaching - learning activities, to make the children to participate and learn actively.

Characteristics of child friendly environment :

- Teacher should create fearless, and stress free environment in the classroom and encourage them to ask any doubt with out any hegitation.
- Make sure that every child to participate.
- Providing the teaching - learning activities suitable to the age, class and ability levels.
- Activities should be encouraging, motivating and interesting.
- Teacher should act like a friend, philosopher, guide and facilitator.
- There shoud be a space to learn with peers, and mutual interaction.
- Respect the opinions of the children.
- Fearless, stress free and no punishment type of classroom environment.
- These should be a provision to express his views, feelings, and openions without any hegitation.
- Much importance will be given to appreciation, motivation, encouragement and opportunistic in the classroom.

Learning through activities, explorations and discovery - implementation and responsibilities

RTE-2009 has clearly stated that learning must be taken place through activities, explorations and discoveries. At the field level, these has to be implemented by the teachers in the classrooms. We have been discussing about activity based teaching methods in various diases in different situations for decades along. Textbooks are also prepared based on these activity centered methods.

1. It is the complete responsibility of teachers to implement activities, explorations and discovery methods in the classrooms. Accordingly, the teacher must prepare and plan well in advance about the activities, and questions that are discussed in the classroom, before going to the class. That is, it is very important the teacher must be ready with preparation like reading, and notes preparation. Teacher must plan the activities of exploration and discovery with suitable examples and provide the tasks to the children and make them to learn the new concepts.
2. The responsibility to observe the classroom activities, and to give suitable suggestions and guidlines to the teachers, is of the headmaster of the respective school.
3. The headmaster has to accept the responsibility of submitting and discussing the learning activities that took place, in form of a progress reports in the meetings held at S.M.C. and mandal levels.
4. Monitoring officers, and content experts has to visit the schools frequently and observe the classroom teaching and assess how the learing through activities, explorations and discoveries are going on ? They also suggest the teachers whenever it is necessary.
5. The department of education, DIET, CTE and SCERT should prepare suitable materials and provide training cum orientation programmes to the teachers at field level about conducting the teaching - learning activities through activites, explorations and discoveries. After the orientation cum training, an applicable and practical programme should be conducted. It is very important that the teacher should be self motivated more than the training provided.

Indicators of Implementation :

- Teachers plan and teaching notes should assists the questions and activities that are going to be discussed with the learners.

- Instead of sitting in the rows and columns, the learners should change their positions into elliptial, semi-circular forms and groups.
- Students inspite of listening to the teacher, they should also question, ask and discuss with peers. They should express, work in groups and submit their work to the teachers.
- Instead of lecturing, listening, reading methods teaching should be done by discussions, questioning, doing activities, and working on projects etc.
- Children should learn by using dictionaries, atlases, logarithms, graphs, maps, tables and figures etc, by themself.
- Teacher should have his teaching material, and learner should have their learning material.
- Teachers preparation should clearly enlist the activities of the lesson plan, experiments, projects, games and material that is going to be used.
- Learners should involve in the learning activities by observing models, charts, material, by participating actively in maths games and language games etc.
- Conducting continuous comprehensive evaluation and the progress should be recorded carefully.
- Progress should appear in the performance of the children from prognostic test, formative test and to summative assessment.

Conclusion :

In this chapter, we come to know that according to the guidlines of the RTE-2009, how should be the learning take place. Also, we understood the ways and means to create child centered, child friendly and stress free environment for the learners and the methods of their learning. Thus, learning should not be happen by reading, listening and saying the information from the textbooks itself. We should not feel that the children performed well, by their answers which were copied from the question banks, guides and other study material. We should not be happy with their performance in the examinations which were conducted to test their memory and make them to undergo stress and tension. Real learning will be taken place, when the learners actively participate in all teaching - learning activities which consits of various types of projects, seminars, discoveries, explanations and activity based teaching methods. It is the responsibility of the teachers at the ground level, to create such child friendly, encouraging and stress free environment and to provide as many as direct learning experiences to the learners. Accordingly, the classrooms are to be prepared and such environment should be created.

RTE-2009 related sections for fear free environment and freedom

The provisions of section 17, the Right to Education Act - 2009 are given as follows :

❖ Physical punishment and psychological harasement of children are prohibited.

- According to section 17, under subsection (1), a boy/girl cannot be physically punished and psychologically harased.
- Under subsection (2), those who ever act against the provisions of subsection (1) will undergo necessary disciplinary action as per their service rules.
- Section 8 and section 9 of the RTE act give, directions to the respective governments and local bodies that children belonging to backward classes, under previlaged and suppressed groups are not being discriminated, they are admitted to primary education and take necessary actions, as it is their duty to complete their education without any abruption.
- In case of violation or impingement of child rights, RTE act will not hinder the actions taken against such violation according to the IPC 1989 by the act of prevention of violence against S.C., S.T's.
- According to section 29, subsection (2) and clause 'G', curriculum has to help the children in expressing their views freely and by liberating them from the fear and anxiety during the period of evaluation.
- According to section 30 and section 31, the National Commission for protecting the child rights, and the State Commission are excented to protect the child rights.

It is possible only through the 'fear free environment' to achieve the objectives with out any stress, to create child friendly environment which is convient for their learning and providing opportunity to express their views freely without any punishment and discriminations. For such, fear free environment and self expression every teacher and Headmaster has to be industrious.

Implementation of Fear Free Environment :

- Preparing the rules and regulations by discussing with the students.
- Appreciating and concentrating on good behaviour and positive attitude among the learners.
- Consult the children about their desirable behaviour and expected results.
- Executing varous plans to develop positive attitude.
- Not comparing one's progress with others.

- Providing a chance to children to express their view and to respond.
- Explaining their limits and giving clearity on their progress.
- Providing ample no. of opportunities, whenever necessary.
- Discussing the progress of a child with his/her parents and as much as possible showing their good deeds and their abilities.
- Implementing necessary strategies by discussing with children.
- Showing positive attention.
- Appreciating the children at their good times.
- Providing extra work to those complete their work quickly.
- Neglecting the tenuous incidents and mistakes.
- Instead of ordering "You do like this", providing a space to get the word "I do like this" and giving such freedom.
- Avoid using the commands like "don't do".
- Talking to them in a positive manner.
- Encouraging them to develop their own limits and self control.
- Establishing a necessary classrom.
- Developing interest on games and making it compulsory.
- Providing meaningful, thought provoking tasks.
- Providing space to express their openions and feelings.
- Listening to them carefully and showing faith on them.
- Involving the children efficiently through adopting activity based teaching methods.
- Motivating the children and encouraging on their interesting fields.
- Understanding the family background of the children.

Continuous Comprehensive Evaluation - Conceptual understanding

'By RTE-2009, we came to know that the schools has to be responsible in achieving the comprehensive development of children. They have to be developed physically, psychologically, morally and emotionally. Accordingly, the content matter of the lessons should be designed, develop their interests, values and attitudes etc.,

What is 'continuous' ?

When the evaluation in the schools, observed in a broad sense, we must give cent percent priority to the growth and development of the child.

Here, 'continuous', means, instead of limiting the progress of a child to a particular incedent, situation or a test of 3 hours duration. Observing the progress continuously. That is observing the physical and psychological development of a child, continuously and in a proper way, in the school, out of school, in the play ground, field trip etc., Identifying the drawbacks of learning and taking necessary preventive, remedial actions which help the teacher and the learner for their self evaluation.

What is 'Comprehensive' ?

Comprehensive, here it means, the all round development of the child. That means, the development of a child in physical, psychological, moral and cognitive domains. In this regard, we need to give equal importance to all educational activities, i.e. curricular and beyond the curricular or non-curricular issues. That means, languages, mathematics, sciences and social studies along with art and work, morals, health and hygine, and life skills etc. are given equal importance. Thus, the word 'comprehensive' not only keep the growth and development of a child in view, but their desires, interests, attitudes and abilities are also equally considered. So, the educationists, recommend that in the comprehensive education in the subjects like arts, literature, aesthetic sense, logical reasoning, sculpture, philosophical discussion and music etc. The teaching should be provided upto higher levels.

Along with these items, evaluation will give equal priority to the creativity, analysis, and logical issues.

What is comprehensive development of the child ?

It is very important to know the meaning of comprehensive development, in the context that bringing out the alround development is the chief aim of education. As schooling and education depends upon the physical growth of the children, such schooling or education must give importance to healthy excercises, games and sports which are required to maintain the balance of height, weight and health according to the age of a child. Through education children must be habituated to friendship, co-operation, tolerance, and patience, like attitudes. They have to develop logical discrimination, creative thinking and problem-solving and ready to face the challenges in their life. They have to be ready to accept the social responsibility as a person of good attitudes and aptitudes. Thus, comprehensive development is not merely aquiring the

knowledge from the textbooks. But it is the development of physical, psychological, emotional, social and cultural aspects. For that sake, knowledge, skills, abilities and values must be developed among the children. So, all these provisions which leads to comprehensive development of children must appear as the learning items in the school. Among these provisions, no diserimination should be shown as curricular and co-curricular activities. All these activities should be provided to the learners and be evaluated as a part and parcel of education.

Why CCE ?

'Evaluation' does not mean that conducting the test and examinations. Conducting terminal examinations and unit tests, in the name of evaluation, does not help the learners to know their level of 'learning'. These methods of examinations, only test that how much the learner memorised the information but not to assess their various abilities. In the name of evaluation, the learner under goes sever stress and fear by writing various types of tests like sliptest, flash test, unit test, terminal examinations and entrance examinations etc., So, the tests which merely assess their memorization power may not be useful to develop their emotional, social developments. Hence, there is a need to evaluate the progress of the learners continuously and comprehensively. When the learner does not feel that he/she is not undergoing a test and participates in the evaluation process to evaluate self and own abilities in a fear free environment, then the results of evaluation help them a lot in providing feedback and conducting the remedial activities to overcome their difficulties. Thus, for the comprehensive development of a child with respect to their abilities, tasks, aptitudes, physical growth, values and attitudes, and aesthetic sense etc. and to understand their needs, progress we need continuous Comprehensive Evaluation. In assessing the progress and above said abilities of a child, the evaluation which help us, is called the comprehensive evaluation.

Characteristics of CCE

The purpose of evaluation is not to make the child to memorise and write the mugged up information in the eaminations. It's purpose is to help the children assessing the learning experiences that are provided in the classroom with respect to bring the modifications in their cognitive, affective and psychomotor domains. The information which is provided through the different subject to the pupil is not enough to create their awareness and wisdom. Providing necessary analytical, creative, logical thinking which are very important for their future, and providing the life skills like self discipline, social adjustment and sensitive reaction to the problems faced in their life etc., and development of various abilities, is the responsibility of a school (NCF-2005). To achieve all these aspects of life through the text books, various programmes

have to be conducted in the schools. We have been treating these aspects as curricular, co-curricular and extra-curricular activities. Because of not giving equal importance to all these activities, the comprehensive development of the children, is not taking place as it is expected. In this regard, the State Curriculum frame work (S.C.F.-2011) has rightly indicated that there should not be any differences between curricular and co-curricular activities and all the activities will be treated as lessons itself. Accordingly, in continuous comprehensive evaluation, all the developments wiz, physical, psychological, emotional, and social, will be given equal importance and evaluated comprehensively. Let us see, what dies the CCE expecting, from the view that is being discussed above.

- Development of cognitive, affective, and psychomotor skills among the children and their evaluation.
- In place of classroom activities like memorising the information and mugging up, encouraging the children to construct their own knowledge by analytical thoughts. Motivating them to develop reflective thinking and to express their views clearly without fear.
- Considering evaluation as a part of teaching - learning process.
- Improving the teaching learning methods and learner's learning abilities through proper evaluation. To amend these ways and abilities by continuous observation.
- Providing right feed back to the children that where they are facing difficulty in learning and to teach accordingly.
- To help the teaching - learning process to be child centered.

Thus, continuous comprehensive evaluation should be implemented as a part and parcel of teaching learning process. It leads to proper understanding and assessment of various classroom activities that are helpful in comprehensive development of the learners. Under CCE we must give equal importance to all curricular co-curricular activities with out any discrimination and implement them.

Thus, there should be a proper planning for implementing evaluation as a part of learning, and we must understand the nature of evaluation.

Nature of Assessment :

Assessment as learning :

The learning experiences which are provided in the school leads to the comprehensive development of the child. The evaluation which takes place during the teaching - learning

process is called as formative evaluation. In this type of evaluation, the learner is evaluated while he/she is participating learning situation. It is possible to observe the child, while he/she is participating in the learning situation, how he/she is trying to comprehend the content ? How they are expressing their views ? and simultaneously their doubts will be cleared. In such situations, learning and evaluation go by hand in hand. During the formative type of evaluation, the teacher will hep the learner to rectify his errors and to overcome the learning difficulties. If an activity or a project is given to the child and if the child complete that projet and submits the report, then we will easily assess how far he learned the concept and we can assess his progress also. Thus, evaluation is nothing but knowing the progress of learning.

Assessment for learning :

When the child participating in the learning situation in the classroom, if we observe how far the child is learning the concept ? Where he is finding difficulty ? In which areas he needs more support ? and how much help he need ? and consider these aspects, accordingly, if modifications are taken in teaching methods for the better learning, then such evoluation is called as 'an evaluation for the betterment of learning.

In general, for the sake of evaluation, we conduct a test or observation. But we will not bother about where the child is lagging behind, based on their results, we will not provide any feedback or identify the concepts where he needs our support. But, it is what the child that exactly needed. It is very important to provide support for the betterment of learning, through evaluation. After giving the homework or assignment, the teacher has to observe the note books and identify where the child is commiting mistakes and rectify them then and there itself. Such evaluation is nothing but the formative evaluation.

Assessment of learning :

Assessment of learning is nothing but assessing the child that how much he has learned the concept? Children, while participating in the learning activities, gain the skills on process, knowledge on various concepts and various forms of transactions. Thus, evaluating the knowledge acquired during the teaching - learning process after some period of time is known as "assessment of learning". This is being expressed in the form of grades and marks of the students. This may be conducted by the teachers or any external persons or by both the people. In this method so many children will undergo the evaluation process. They are evaluated at the same time and evaluated by the same type of measures.

These type of evaluation will be taken place at the end of a term or at the end of a course. All such assessments are called as "Assessment of learning". Through this evaluation,

the final decision can be taken to assess the child's achievement of learning. They may be taken place by the end of the course wiz, quarterly, half-yearly and annual examinations etc. Such type of evaluation is called as the "Summative Evaluation" or Summative Assessment.

Areas of Assessment (1-5 and 6-10 classes)

At Primary level (1-5 classes)

- First language Telugu/Urdu
- Mathematics
- Environmental Science
- English
- Art and cultural education
- Health, physical education, yoga, and meditation.
- Work and computer education
- Value education, life skills and attitudes.

High school level (6-10 classes)

- First language Telugu/Urdu
- Second language
- Third language
- Mathematics
- General science
- Social studies
- Art and cultural education
- Health, physical education, yoga, and meditation.
- Work and computer education
- Value education, life skills and attitudes.

What to assess ?

Languages :

1. Listening, speaking by thinking.
2. Reading, responding by comprehension

3. Writing by own (biography)
4. Development of vacabulary
5. Creative expression and appreciation
6. Knowing more about the language

Mathematics :

1. Comprehension of the concepts, problem solving
2. Reasoning and proof
3. Communication
4. Connections
5. Representation and visualisation

Environmental Science :

1. Understanding the content
2. Questioning - Formulating hypothesis
3. Experimentation, field observations
4. Communicatino skills
5. Drawing figures and maps, preparing models.
6. Altitudes, appreciation, and general life applications.

General Science :

1. Understanding the concept
2. Questioning - formulating hypothesis
3. Experiments, field observations
4. Information skills
5. Drawing figures, graphs, and communication through preparation of models.
6. Aesthetic sense - altitudes, appreciation, bio-diversity - general life applications.

Social Studies :

1. Understanding the content
2. Understand the content by reading, interpretation
3. Information skills / Communication skills
4. Reaction or response on social and current issues

5. Map pointing skills
6. Sensitivity - appreciation, attitude.

Arts and Cultural Education :

1. Coloring, drawing figures, decorating, preparing models and specimens (toys)
2. Tunegram, origamy, stiching and fabrication
3. Mono acting, Drama, Choreography
4. Singing, instrumentation (using the instruments), dance - exhibiting the indegenious art forms, mym.
5. Our culture, literature and arts.

Health and Physical Education :

1. Interest in participating, obeying the rules and regulations, sportive spirit, special skills
2. Yoga, meditation, scouts, guides, N.C.C.
3. Family relations, safty and first aid
4. Health, nutritious food, good food habits
5. Personal, sorrounding cleanlyness, good habits.

Work and Computer Education :

1. Preparing models, objects, utilising tools and equipments.
2. Using individual services, participating in functions. (Internal curricular programmes, excenting the responsibilities)
3. Learning based on computers
4. Using computers
5. Commutunity programmes, donating labour.

Value Education, Life Skills :

1. Discrimination power of good and bad, good behaviour
2. Constitutional values
3. Patience, kindness, empatly wiz, personal values
4. Life skills, thinking skills
5. Positive attitude towards teachers, peers, school, public & government properties etc.

CCE - How to assess - Procedures :

As a part of continuous Comprehensive Evaluation, the evaluation methods that are implemented in the schools should be able to observe the learner completely and record the observations properly. It is necessary to implement evaluation, chronologically according to the schedule, to observe the children, inside the classroom and outside the classroom, by the teachers. Such evaluation may be of various types wiz., weekend tests, half-month, monthly, terminal etc. But, what ever the type of evaluation it may be, no two students are compared in their efficiency from the results of the tests. Also the evaluation must help for the fixation of knowledge that is learned and observe that how the child is learning ? What did he learn ? etc. We have to evaluate sensitively, the knowledge, comprehension, application analysis and adjustment nature in new situations along with attitudes, tastes, aptitudes, emotions, special interests, physical growth and health of the children. Such evaluation is of two kinds.

1. Formative Evaluation / assessment
2. Summative Evaluation / assessment

Formative Assessment :

The assessment which takes place during the course of time, and which improves the learning of a child by observing him, while participating in the learning activities which are provided in the classroom and evaluates that how did he learn? and what did he learn? etc., is called as Fomrative evaluation. Formative evaluation is the one which helps the children to speed up their learning, and which takes place in a fear free environment. During this evaluation, the teacher has to observe the child continuously and on his progress and provide necessary feedback to rectify his mistakes. Formative evaluation helps the children, instead of providing masks and grades, by explaining about their abilities and achievement progress and suggest them with suitable remedial works, encourage the learner to improve their learing. The teacher can estimate what does the child learn ? How does he learn? based on the group works and project works etc. The teacher can assess the learning of a child 'by the discussions that took place in the classroom, by their answering, observing their class works, home work and assignments etc., Such type of evaluation is known as Formative Evaluation.

It helps the teachers and students by providing immediate feedbacks during the time of teaching - learning process and make convinient to correct and rectify their mistakes. Accordingly, formative evaluation suggest the necessary modifications in teaching and learning activities also.

Characteristics of Formative Evaluation :

- Observing, the child that how is learning, during the time of teaching - learning activities.
- It is an ongoing assessment to bring the improvement in learning.
- Improves, teaching and learning.
- It concentrates on the process of learning.
- It effects on the 'internal, pre-determined objectives and methods.
- It identifies the particular areas to be improved.
- It is flexible to modify the ongoing teaching methods and approaches.
- It tries to bring progress in the course.
- It helps the teacher and the child to learn mutually.
- It can observe and identify the issues at minute level and provide immediate feedback.
- Children diaries, notebooks etc. are used to evaluate the learner.

Summative Evaluation :

Summative Evaluation takes place at the end of the course. Summative evaluation means the evaluation which is used to evaluate the sum total of the learning aspects which are resulted by the teaching - learning activities of the child. It is a method to be adapted to observe the achievement of children at the end of the course or at the end of a particular curricular activity, in the view of determined learning objectives. In this method it is happen to observe that how much a child has learned ? What did he learn? etc., It will be taken place in form of paper-pencil type tests and evaluates the content related aspects only. It is taken place in the name of terminal, annual examinations and produce ranks and marks as per the achievement of the learner. By this type of evaluation, it is possible to know whether the learner has qualified the exam or not. Children has to learn and understand the concepts, then undergo the summative evaluation. So, they will not face any soft of fear and anxiety. This type of internal evaluation is useful to reduce the unwanted competition among the learners. The nature of summative evaluation is given as follows :

- It is a method of evaluating the learning and achievement.
- It will assess the total learning in the form of terminal and annual exminations like annual, quarterly and half-yearly examinations.
- It is a testing method in which the teacher himself prepares the question paper based on the academic standards of the subjects to assess the progress of the learner.
- To conduct the test, teacher has to prepare the question paper based on the set academic standards of the subject (you can observe the contentwise, weightage tables in 9th chapter)

APSCF - 2011 : IMPORTANT PRINCIPLES

Content :

Providing education and educating the people of the country was being treated as a respectable programme in recent past. But providing quality education to all the children of school age upto the elementary level became a Fundamental right now. Right to free and Compulsory Education Act - 2009 i.e. R.T.E. - 2009 made it as a Fundamental Right and the provision given to all the children of the age group of 6-14 years. The constitution of India has clearly stated to provide free and compulsory Education for all children of the country which is of wide variety of cultures, traditions and languages. For the past six decades the country has undergone through various programmes, and functions that are implemented for that purpose of providing Education for all. The programmes are planned and being continued. But still there are some challenges coming on to the screen. Child labour, out of school children, lack of quality, lack of responsibility, accountability mechanical teaching - learning activities, burdenful of books with loads of information, in the name of standardisation, stress, anxiety, marking procedures; the evaluation that was permitted to marks and ranks diminishing value system, or detoriation of values, commercialization of education, which results in disparities in the system of education as the haves and have nots are having different qualities and kinds of education, and the lack of basic infrastructure facilities are some of the noted challenges that we are coming across. **In this view the position of our state is also not in different when compared to entire nation.** Along with these, decreasing in the number of children in govt. schools, memorising the information is merely treated as acquisition of knowledge and the

people of schedule tribes, minorities and girls etc. are not getting equal amount of educational opportunities when compared to the other groups, are also some of the burning problems of the present system.

To overcome all these situations, the Govt. of India has launched a programme at national level, called as "National Curriculum Frame Work - 2005", based on the report on "Learning without burden". The National Curriculum Frame Work has rightly indicated that "the education that provided to the children should not be permitted to the rolt memorization. It should be meaningful, knowledge acquired is to be applied to the day to day life. Learning should not be permitted to the text books, the evaluation procedures are to be amended to overcome the fear, anxiety and completion.

Along with these aspects, the Right to Free and Compulsory Education Act - 2009 came into practice by constituting an act of providing quality education for all the children. Teachers are the key persons in entire school education. The quality of education is based on the construction of quality teachers. The National Council for Teacher Education (NCTE) has constituted the National Curriculum Frame Work for Teacher Education (NCFTE-2010), for this purpose.

In the light of the recommendations and guidelines provided by the report of learning without burden. The National Curriculum Framework (NCF) - 2005, The Right to Education Act (RTE) - 2009 and the National Curriculum Frame Work for Teacher Education (NCFTE-2010). It is opined to that there is an immediate need to bring amendments in our state school education system.

For that sake, to form a State Curriculum Framework - 2011 in our state, the Govt. of Andhra Pradesh had constituted a steering committee, and an Advisory board which consists of lecturers and content experts at national level, teachers, members of NGO's and the professors of different Universities. It also appointed a Focus Group to propose and shape out the position papers on each individual aspect by analysing the present situation on 18 major issues that are related to different subjects and co-curricular activities.

The details are :

1. Position Papers on Subject Areas :

1.1 Position papers on language and language teaching.

1.2 Position paper on English teaching

1.3 Position paper on Science education

1.4 Position paper on Mathematics education

1.5 Position paper on Social Sciences education

1.6 Position paper on Habitat and learning

1.7 Position paper on Art education

2. Position Papers on Systemic Reforms :

2.1 Position papers on Aims of Education.

2.2 Position paper on Systemic Reforms.

2.3 Position paper on Teacher Education and Teacher Professional Development.

2.4 Position paper on Assessment of learning.

2.5 Position paper on Educational Technology.

2.6 Position paper on Curriculum and Textbooks.

3. Position Papers on State Concerns :

3.1 Position papers on Education for Diversities - S.C., S.T., Minority, Girls, inclusive.

3.2 Position paper on Early Childhood Education.

3.3 Position paper on Work and Education.

3.4 Position paper on Ethics, Values and Human Rights.

To form the State Curriculum Frame Work-2011 and the 18 Position Papers, the following reports are taken into consideration.

They are :

- Constitutional Provisions, Preamble of Indian Constitution and 73, 74 amendments of the constitution.
- NCF - 2005
- GOI - Report on learning without burden.
- Right to Free and Compulsory Education Act - (RTE) - 2009.
- National Curriculum Frame Work for Teacher Education (NCFTE - 2010).
- National Knowledge Commission Recommendations.

The APSCF-2011 has proposed the following principles based on the recommendations made the above said reports. Accordingly the position papers on different subjects, co-curricular aspects, the syllabus and the academic standards are prepared. Also, the textbooks are modernised, and the examinations and evaluation process will be amended. In the same line, once we need to observe the perspectives of the state proposed by the APSCF-2011 and key principles of APSCF-2011.

Perspective of the State :

- The primary aim of education is to prepare the children as responsible and rational citizens. The educational objectives as to give importance to this aspect. Also, they have to prepare the children to appreciate their culture, traditions, and heredity and involves them in the process of social change.
- The preparation of the curriculum must be centered around the needs and aspiration of the child.
- The curriculum is to be framed based on the psychological stages of the child and cognitive sequence in their learning. It is supposed to give much priority to reinforce the process rather the product. It, then results in the learner to acquire the skills like analysing and meaningful learning rather than mugging up the information.
- Basically knowledge is integrated. Compartmentalising such knowledge into different subjects is unnatural. It is unbiased to say that knowledge is the sum total of the cognitive abilities. Through a single aspect of the knowledge one can achieve different objectives, like achievement of language abilities, achieving the mathematical abilities, and to develop the social awareness, to develop the reasonable thinking, to analyse and to determine etc.
- Curriculum is dynamic. Its scope should not be limited to the textbook itself. It has to lead to nurture the creativity among the teachers, and learners by linking with the environment and the world around them.
- Decentralization of educational administration, all the programmes related to school is to be implemented along with the curriculum.

Key principles of APSCF-2011 :

- It is important to keep in mind that to make the child to learn according to his natural abilities and strengths.
- To respect the language of the children and different systems of knowledge available in the society and to apply them in their studies.
- To inter link the knowledge with the life that exists outside the school.
- To discourage the real memorization and to encourage learning by doing, learn by mutual interactions, projects, discoveries (Explorations), experiments and analysis, among the learners.

- Curriculum should provide the opportunities for the all round development of the children instead of limiting their learning to the text books itself. Accordingly the changes and modifications of the text books should be taken place.
- To simplify the examination system, by implementing the continuous comprehensive evaluation and integrating with the teaching - learning activities, to amend the evaluation methods by helping the child to assess his learning instead of testing how much he learned.
- To conduct the teaching - learning activities based on the methods of critical pedagogy and social constructionism which leads to convenient and meaningful learning by integrating different aspects of curriculum.
- To provide importance of the culture, experiences, and local issues of the child in the classroom.

According to these perspectives of the state and the key principles. The State Curriculum Framework-2011 is prepared.

Text Books :

The textbooks which are prepared previously undergone changes, approximately once in a decade. But the key changes are taken place only for the name sake. There were no subjectwise position papers for and no proper curriculum Frame work available in the past.

Due to this, the lessons are changed in the text books but not the arrangement of content and variety of exercises. In the same way, the desirable objectives of the respective subjects of the school education, or the nature of the subjects or the nature of the learners are completely neglected in preparing the textbooks. Also, in the name of standards the text books are burdened with loads of information, and the concepts of higher classes, especially in the subjects like mathematics and sciences are merged in the lower classes. It leads to mental pressure and psychologically burdenful to the learners. Although, the programmes like APPEP, DPEP etc., brought some changes in text books, there is a burning need to change them completely, by NCF-2005, RTE-2009 and APSF-2011.

By crossing all these hindrances, The state curriculum Frame Work-2011 has made the following propositions to prepare meaningful textbooks.

- To prepare subject wise position papers for shaping the text books of languages, mathematics, science and social studies.

- The text books are deserved to develop thinking among the children and they are to learn by applying their natural abilities and strengths.
- The text books has to provide an opportunity to the child to construct their own knowledge and thus the child has to get an opportunity to apply their knowledge in their daily life.
- The text books has to provide an opportunity to the child to go beyond the level of the text books and to consult, to refer the doctrines, magazines, papers and equipment and also to interact with the community members.
- The language that is used in text books should be simple and easy to understand. It should not hinder the natural flow of learning. It has to consider the multilinguality of the learners.
- The lessons that are given in the text books should avoid the gender, caste, and creed eliseminations. Instead they have to develop confidence, logical thinking and awareness about human rights among the learners. For that sake, they have to yield, the development of thinking skills like reflection, critical thinking, dialectical thinking, creative thinking and communication skills.
- The lessons should consists of the indigenous arts, traditions, cultures, productive creativities and the indigenious aspects and issues.
- The exercises and practice examples are to be according to the academic standards and expected learning outcomes of the respective subject areas.
- There should be different types of exercises which develop the power of thinking and consists of various activities, project works, discoveries, experiments, open ended questions, games, and puzzles etc.
- The excercises of the text books should lead the child to learn by individually, by participating in the group works and to learn by taking part in the whole class activities.
- The text lessons and excercises should be convinient to the child to observe the co-curricular activities like human values, ethics and morality, art, work, health and hygiene etc.
- The text books has to inter link or associate the present abilities by providing the revision of previous abilities and to by the foundations for the future classes.

- The text books are to be attractive and beautiful. It should consists of quality paper, clear print & colorful pictures etc.

Teaching Learning Processes :

Teaching learning activities are desired to make the children to learn meaningfully instead of make them to learn by roat memorization, mugging up the content, highlighting from the guides and question banks. In this regard, APSCF-2011 has made some propositions. They are :

- Mutual interactions, self expression, and questioning should play a key role in entire teaching - learning process.
- Projects, researches, enquiries, activities, project works, and games etc. must be there as a past and parcel of all teaching - learning activities.
- Teaching - learning activities are not merely reading out the content or lecturing by the teachers. The teachers have to motivate the children to learn and to participate. They have to utilize all necessary equipment and make it available to the learners. At the outset the teacher has to create a learning environment in the class room.
- The teaching - learning activities has to be organised in such a way that the child has to learn individually, with group, through his teachers, and the Teacher - Learning material and the child has to utilize all the learning situation properly.
- The learner has to be provided an environment to learn in his mother tongue. Teachers must use the language of the learner in teaching - learning process.
- The designing of teaching - learning activities should begin from their previous knowledge and their person experiences.
- The indigenous arts, provisions of production and the experiences of the labour are to be utilised as the resources of teaching - learning activities.

Evaluation and Examinations :

We have been depending upon the examinations to evaluate the learners. The examinations and tests instead of evaluating the learners abilities, are making the learners as to feel inferior, to undergo stress and anxiety and to incriminate them and thus the examinations are dominating the entire system education.

In this regard, APSCF-2011 put forward some statements. They are as follows :

- Evaluation and examinations are not only to assess the child but also assess their learning.

- As per the guidelines of RTE-2009. The evaluation must be taken place continuously and comprehensively. (Continuous Comprehensive Evaluation - CCE)
- Along with the examinations, the learner has to be assessed by using project works, assignments, portfolios, seminars, exhibits, anecdotes, and observations. All these aspects must be given suitable weightage in annual examinations.
- Considering all these aspects of evaluation must be induced in the teaching - learning process.
- The pattern and nature of questions in examinations has to be changed. From the questions which encourages the rote memorization, which are limited to the content provided in the text books only, to the questions which are convinient to the learner to write on their own, the questions that provide an opportunity to the learner to express their experiences, open ended questions, and application oriented questions.
- The evaluation process must help the learner to assess the level of applying their acquired knowledge.
- To excente the transparent and open evaluation methods for the convenience of the learner for his self evaluation and for his parents to assess the progress of the child personally.
- The Continuous Comprehensive Evaluation - CCE, that is executed in the school must be included in the board examinations with suitable weightage.
- The answer sheets of the board examinations must be provided to the parents on demand and to there should be provision of revaluation.
- The co-curriculum activities like attitudes, values, work, health and hygeian, sports and games etc., are also to be evaluated properly.

Systemic Reforms :

For the successful execution of APSCF-2011, it has rightly propounded the following systemic reforms along with some modifications of above said issues.

- For the decentralization of school administration and management, the Panchayath Raj organisations must be collaborated.
- To organise ECE centers under the supervision of Headmasters. The health and hygene and child care responsibilities are given to ICDS Department and the educational resonsibilities are to be taken by the Department of education.

- According to the recommendations of RTE-2009 all the schools are provided with basic infrastructure and basic amenities and accordingly teachers are to be recruited.
- To form school management committees by parents of the school children and make them to participate in school administration.
- Decentralisation methods are to be implemented in planning, execution, monitoring and utilisation of funds and resources etc.
- To strengthen the teacher education along with teacher help and cooperative organisations.
- To develop the answerability by forming and implementing the performance indicators for all the systems that related to school education (school, school complex, mandal resource centre, DIET, SCERT) and individuals.
- To prepare and implement a curriculum frame work for teacher education and bring out reforms in teacher education.
- To prepare separate readers for the children of different classes to develop human values and higher and respectable attitudes among them.
- To provide all basic infrastructural facilities along with latest information technologies to the schools.

The versatile development of any society is possible only through the complete development of that society in the field of education. The base for such development is laid on school education. To reform school education, to develop the skills, attitudes, values among the children, who inturn leads the development of that society and who become responsible and rational citizens of that society. The state curriculum frame work - 2011 is providing guidance and support. In this regard various position papers are prepared for different subjects and made certain propositions. Systemic Reforms will be taken place to implement these propositions. For that sake, the opinions and suggestions of the people of different categories, educationists, teacher's unions, teachers, and different voluntary organisations are invited and thus the modifications and changes will be taken place. Thus, we will try to achieve the development in education sector and make our state as apex or fore runner.

NEW MATHEMATICS TEXT BOOKS - PHILOSOPHICAL ISSUES

1. Why to prepare the text books newly ?

The text book is an important tool to implement the curriculum effectively. Text books play an important role to achieve educational objectives and to guide teaching - learning activities. The text books should be child centered. Now a days everybody is frequently talking about the same issue. So, when total curricular process is to be child centered then the interests and aptitudes, the learning styles and their foundations of the learner and their background should be prioritised in developing the text books.

In general, fundamental changes will be taken place preparing mathematics text books. The reason behind this is the curriculum frame work, which is the basis for preparing a text book and subjectwise position papers are not being prepared properly. Due to this changes occur only in the pattern of lessons but not in variety of arranging the content and excercises. The desirable objectives of the subjects of the school education or nature of the subject, nature of the learners etc. are not properly considered in shaping the text books. In the name of standards, the text books are filled with loads of information. The content like mathematics, science which is supposed to be learned in higher classes are merged in lower classes. In turn, it is psychologically burdening the poor learners. But, because of the programmes of APPEP, DPEP etc., there are certain modifications taken place in preparing the text books of primary classes.

The text books which were prepared in the past had provided the scientific knowledge and information to the learners mathematically. Even though in accordance with the changes of time, the changes that occur in the field of education, to serve the changing educational needs of the learners and by considering the suggestions made by the National Curriculum Frame Work (NCF-2005), we have prepared the State Curriculum Frame Work (APSCF-2011). In the same way, we determined the syllabus and the standards of education as a part and parcel of the State curriculum and based on the position papers of mathematics.

The change in mathematics syllabus and teaching - learning activities became unavoidable in the light of considering the position papers on mathematics which are shaped as a part of the State Curriculum Frame Work - 2011, and Right to Education Act - 2009. By the way, APSCF - 2011 has put forth some proposals to prepare meaningful text books. The modifications are to be more comprehensive and complete, when we consider all the NCF-2005, APSCF-2011 and RTE-2009. Accordingly, the new textbooks for 3rd class are prepared in the academic year 2012-13 and for 45th classes are prepared in the year 2013-14. Is the part and parcel of the same process, the text books for 3, 4, 5, 6, 7, 8 and 9 are also prepared.

2. Based on which important principles, the new text books are to be prepared ?

If you look at the suggestions made by the NCF-2005, RTE-2009 and APSCF-2011, the text books must be child centered and the importance must be given to the areas like interests, aptitudes, learning styles, and contexts in developing the text books.

The Fundamental Principles of the Andhra Pradesh State Curriculum Frame Work-2011:

- Focusing on the learners to learn according to their natural strengths and abilities.
- To respect the language of the children and various knowledge organisations or epistemological organizations of the society and to apply them in their learning.
- By discouraging the rott memorization among the learners and to encourage the meaningful learning through the methods of group activities, mutual interactions, projects, discoveries, research activities, experimentations and analytical tasks.
- Providing opportunities for all round development of the learners in the curriculum and not to ristrict or limit the learning only to the text books. Accordingly the modifications has to be taken place in the text books.

- Simplifying the examinations by implementing continuous comprehensive evaluation and integrating with the teaching - learning activities.
- The methods of evaluation should be amended to make the learner to learn more with ease rather than to evaluate the child that how much he know.
- Conducting the teaching - learning activities based on the teaching methods of criticism/ analysis and social constructivism in combining all the aspects of the curriculum, to the convinient way of meaningful learning.
- Providing importance to the cultures, experiences, and local issues of the child in class room.

The proposals made by APSCF-2011 for preparing meaningful text books :

- Subject wise position papers are to be there to prepare the text books.
- Text books are to provide an opportunities to the learner to develop their thinking and to learn by applying their natural strengths and abilities.
- Instead of burdening the text books with loads of information there should be a scope to the child to collect the information, analyse that information and to determine/judge themself.
- Text books are to help the children to construct their knowledge and to provide an opportunity apply that knowledge in their day to day life.
- The text book should provide an opportunity to the learner not to submit themself to the text book only but also to go for reference books, magazines, papers, material and to interact with the professionals and community members for their additional learning and extensive study.
- The language of the text book should be simple and should not hinder to learn. It should consider the multi lingualism.
- The topics of the lessons should not lead to the gender discrimination among the learners. Instead they should develop the confidence, power of thinking and develop the awareness on human rights among the children. Thinking skills like responding, critical thinking, analytical thinking, thinking in multiple dimensions, creative thinking etc, are also to be considered along with the development of interpersonal communication skills.

- The exercises and practice questions should be according to the standards set by the respective subjects and the practice should be resulted in desirable products.
- The text books should contains various types of activities, project works, problems based on heuristic nature, experimentation and problems which can give multiple solutions, problems which can be solved in multiple ways. Puzzles, riddles, and games which promotes the practice among the children.
- The excercises should be in such a way that every child must solve by individually, with group and encourage them to participate in group activities and entire class room activities.
- The text books should provide an opportunity to revise the concepts of previous class and integrate the present concepts to the higher classes while developing the current abilities.
- The physical properties of the text book should be attractive. Quality paper, clear printing, colored with beautiful pictorial representations with ample no. of examples should be placed in the text book.
- Local and fine arts, culture, productive activities, indegenious activities, tasks should be placed as the lessons.

Additional Points :

- The mathematical facts that are presented should be easily understood, encourage individual practice and minimise the fear and anxiety among the learners.
- The learners are able to understand the contextual issues and analyse the situations. They should be able to analyse and solve the problems.
- The child should able to comprehend the methods of knowledge structures, principles of reality and their proofs and deductions.

3. What are the special features of newly prepared books ?

The special features of new books :

I. Physical features :

- The composing of the book is eye catching and attractive.
- The size of the books are flexible to carry and study 4^{th} class text book contains - 160 pages; 5^{th} class - 184 pages.
- Colourful pictures are drawn on quality paper.

- The font size of the letters and legible printing is flexible to the children to read and understand the content.

II. Subject matter (content) features :

- The language used in the book is simple and easy to read and understand by the children.
- The lessons are organised in a orderly arranged i.e.
  - ✦ The mathematical concepts learned in the previous classes are recaptulated and concepts of present classes are convenient to construct the new knowledge.
  - ✦ All the key concepts are illustrated with ample number of examples and are related to real life situations, activities, and games that are easily comprehended by the child.
  - ✦ Try this, do this, type of problems and the concepts given by problems under specific topics, help the children for more comprehension.
  - ✦ Discuss and think how, why ? Type of activities provide deep and extensive understanding of the concepts.
  - ✦ Activities / projects which are convenient to the students to acquire the knowledge through their direct experiences.
  - ✦ Possibility of acquiring the standards of education by solving the problems in different excercises, individually.
- Nurturing the skills of creativity, problem solving, estimation and reasoning through the activities and problems given in he text book.
- These are practice excercises which consists of puzzles, riddles and games, along with the problems which leads to multiple solutions.
- All the notations provided in the book are easily understood by the children.
- All the academic standards/abilities that are to be acquired by the learners after studying the syllabus which are determined according to the rules, are given at the end of the text books.
- A model annual plan format is provided on the inner coverpage of the book which facilitates the teacher to plan his own way to teach the book.
- A special teaching is provided to the teachers to teach the text along with the topic wise notes given in the book.

- There is a facility to answer some of the questions given in the text book itself which works as a work book partially.
- It helps to self evaluation of the learners.
- Immediate feed back and evaluation is provided after learning each specific topic.

4. Through these text books which mathematical abilities can be acquired to the commanding level ?

In this position papers of mathematics there is discussion on the specific instructional objectives that are to be acquired to learn mathematics. They are -

- The students will be able to acquire the skill and develop understanding on the concepts related to number and space.
- The student is able to develop the skill of thinking mathematically.
- The student is able to discover the logical decisions based on their predictions.
- The students will understand the abstract concepts and applies them effectively and efficiently.
- One must understand to consider the problem solving abilities of a child while planning the teaching - learning activities. From the above discussion one can easily understand that some following abilities to be developed by the students by different lessons of mathematics. They are .....

    1) Problem-solving
    2) Reason giving - establishing the proofs.
    3) Expression / Exhibition
    4) Relations
    5) Representation - Visualization

5. What are the important issues to be considered to select the new text books of higher classes ?

- In general, the students of higher levels in mathematics are expected to comprehend the concepts based on number systems, algebra, geometry (linear geometry), concepts of mensuration, and concepts related to organisation of the data. By utilizing all these the student has to acquire the skill of apply this knowledge in solving the problems in his day to day life.
- In higher level i.e. 6-10 classes, the syllabus of mathematics text books is devided into six major domains. They are 1) Number systems, 2) Algebra, 3) Arithmetic, 4) Linear geometry, 5) Mensuration and 6) organising the data and rescheduled into 14-15 units.

I) Number system consists of Natural numbers, whole numbers, integers, rational numbers, irrational numbers and real numbers etc. along with exponents - powers, square roots, cube roots, factorization, playing with the numbers etc. are placed in the topics.

II) The concepts under arithmetical are : percentage, ratio, proportion, multiple ratios, rate percentage, profic, loss, sales tax / VAT, simple interest, compound interest for (annual, halfyearly, quarterly), etc.

III) Algebra consists of variables, algebraic expressions, monomial, binomial, polynomials, algebraic equations linear equations with one variable, linear equations with two variables, inequations and their soluting problems on them, algelmoic expressions and their factorization, Algebroic identities, solving the quadratic equations, etc. are kept as different topics.

IV) In linear geometry, the concepts given are stating from point, ray, lines, line segments etc (21 different shapes) like triangles, quadrilaterals, and their types, their constructions, circles, chord of the circle, arc, symmetry etc, related topics are given as the lessons.

V) Coordinate geometry, containing points, shapes obtaining by joining their points and their perimeter area related concepts are also given.

VI) In mensuration, the topics related to 2D shapes and their area, perimeter, circumference etc. volumes, total surface area, lateral surface area, of different 3D figures are presented in the lessons.

VII) The topics on organising the data are... collection of data, tabulation, and graphical representations, frequency distribution tables, and cumulative frequency courses - Ogive curves, Barograph, pictorial graphs, line graphs etc. for ungrouped data finding arithmatic means, median, mode. Finding measures of central tendencies, some measures of dispertion are also given in the lessons.

- The lessons are framed in such a way that the learners can apply the knowledge acquired in previous classes for fixation of concepts which leads to various ways and means to find the solutions of different problems using examples are kept in the lessons.
- There is a provision for the concepts which develop the abilities of estimation, framing a problem, identifying the errors and their elimination.

6. How the continuous comprehensive Evaluation is accommodated in the new text books ?

In mathematics text books, after learning each concept, to know how far the learner understands the concept, a small excise consisting 3, 4 calculations are given under a task called "Do this". These calculations has to he done by the child by himself. When a child calculates all these correctly, then he will be considered as he understood the concept. Similarly there is another task called "Try these" pose challenges to the learner to apply the concept is solving the problems that it consists of. To solve these problems the child has to discuss with his peers. Like this, the process of evaluation starts with a small concept followed by an excise and continued upto the completion of that concept. At the end, all these concepts are combinedly given as a huge exercise that consists the problems based on all concepts and of different levels of difficulty and of different kind. All these problems have to be solved by the learner by himself. While during so, by the completion of the lesson the learner will be able to understand the concept, calculates, computes, solves, discusses, verifies, thinks extensively about the problem, and complete the task by himself. During this process, the learner interacts, himself individually with his peer group, or with his teacher. Hence, the responses of the learner can be observed throughout the teaching - learning activities, group discussions, and while solving the problems and evaluated comprehensively.

7. What are the necessary actions to be taken to make the teachers to use the text books effectively ?

Though the text books are intended for the learners, the major responsibility laid on the teachers to organise the activities and arrange the contents. That purpose, there are chapterwise instructions given to the teacher in the text books. Simultaneously to understand the text book and to utilize it properly, necessary orientation will be given to the teachers. During this training cum orientation programme; the instructions will be given about how many chapters are given in the text ? What is the purpose of giving each lesson? What are the desirable abilities, skills, to be developed among the learners by teaching these concepts ? How the concepts are introduced ? and how the excercises are given? etc. A planned training will be provided on preparing a unit plan, lesson plan, year plan and understanding the preparation of lesson plan, planning and executing the activities, selecting and conducting teaching - learning activities, implementing continuous comprehensive evaluation etc.

For the solve of all the above activities, a hand boola of teachers is prepared and provided to the teachers. For the conveniency of the teachers all the hand books are kept on the website of SCERT.

The orientation is also provided on the issues like how to provide practice to the learners? When to give the projects ? How to organise the projects ? How to plan & execute the numedial teaching ? viz.

8. What is the role of the teachers in utilising these new text books ?

To make any successful program a well organised pre-planning is mandatory. In leu of this preplanning, the organisation of any programme will be filled with loop holes and the purpose of the programme will be ruined.

In constructing the future of the learners, the teacher, whose role cannot be under estimated has to be pre-planned in utilising the text book efficiently.

Self evaluation, continuous introspection of the teacher for achieving the set standards of the new syllabus by means of a new text book is mandatory. The teacher has to modify the teaching - learning activities according to the changes that all are required. For that he has to be ready and self sufficient.

- The teacher has to read and understand each and every chapter of the text book.
- The teacher has to solve all the problems & verify them without fail.
- He should have complete understanding of concepts which are to be taught in which period what activities are to be conducted and how to organise the syllabus according to the periods.
- The teacher has to prepare the lesson plan well in advance.
- All the activities should be planned in advance if the activities are insufficient then one must providing some more activities by planning them in advance.
- All the resources, material that are required to implement the activities must be selected and planned for better understanding of the concepts.
- The teacher has to read / go through different reference book to acquire extensive ideas of the concepts and collect more information about the lessons for more clarity of the concepts.
- If any doubts arises on any topic, the teacher should consult the expert colleagues or professionals of that subject and clear the doubts.
- The teacher should have interest about the topic and curious to learn and have complete understanding of the subject.
- The teacher not only permitted to provide the information but also provide ample opportunities to the children to develop their reflective thinking, self learning and creativity.
- The teacher should have the clarity of the concepts to be discussed more with the learners and how much time to be allotted for more practice.

KNOWLEDGE - KNOWLEDGE CONSTRUCTION - CLASSROOM APPLICATION

1. What is Knowledge ?

Knowledge is not the information. Knowledge is not given by a person and not received by the other. Knowledge, is not rott memorisation, mugging up the information and reciting it as it is. Knowledge is a conception, it is a visualisation, an idea, a thought that is generated/ originated from the psychological processes that happens in the minds of children. It is the one which is expressed from the experiences and thoughts. It invents the issues like how to think, how to observe, how to analyse, express and visualise etc. Childern express their knowledge, by doing the things like observing, identifying, recognising, recalling, establishing relations, generalising, coming to the decision, using the previous knowledge in new contexts, and future excercises etc. from their own experiences and thoughts.

Children accumulate meaningful concepts by participating, discovering, responding, exploring, and interact mutually with the world and environment that they are surrounded by. This accumulation of ideas, concepts, and perceptions are became knowledge.

The NCF-2005 rightly said that the provisions which we are adching to knowledge reflect our what we imagine as educational objectives. It is not possible to compartmentalise the knowledge and to provide as parts, because of the educational objectives which are assumed to make the children to think critically, to observe, analyse, reasonable, to draw pictures and models, and to respond positively to the variety of concepts and living styles. Thus, knowledge

is the combination of experiences and perceptions, but not memorisation of concepts and mugging up the information, as we have been considering.

Ex : Knowing that Hyderabad is the capital city of Telangana, memorising Akbars date of birth, mugging up the gravitational quotient of the earth etc., are not being considered as knowledge. Infact, knowledge is making the child to combine the concepts like how to observe, how to analyse, how to perceive the abstract, logical situation, how to be kind and how to be sensitive towards the variety of concepts etc. So, the aim of education is not to feed the child by spoon, by cutting the information iinto pieces, but sharpen the thinking skills among the learners.

Thus, we can say that knowledge is not merely the information. **Knowledge is a self driving force and acquired by experiences. It is accumulated by the child only through practical, and decision making comprehension of new information.** In this regard, children need to be provided help in a right time according to their necessity. Children has to construct their knowledge by actively participating in the nature. They should not develop the knowledge from the others perspectives and opinions. Knowledge should not be transfered to the children in the form of information from others, and make them to recite, memorise and write as answers to the given questions. Such actions cannot make the child as educated. As it is defined, knowledge should make the child to think, react, express, and understand the obstract concepts. That means, it should not be mugged up. Instead, Education should encourage motivate the child to generalise, analyse the information that they acquire.

Knowledge can be given completely with in a specific period of times although, it can be transfered in to the brain of a child in the form of information, in an organised manner. The learner will became passive receiver if education became a system of transfering the wearhouse of human intellect children's cognitive, psychomotor domain related aspects like observation, perceptions, reflective thinking, participant behaviours will be lost if transforming education become learning (NCF, P.25). Knowledge is personal and individualised it is universal rather than narrow scoped transformation (NCF-2005).

Every cognitive domain consists of a specific vocabulary concepts, facts, theorems, interpretations, discriptions and methods. The social living and culture are also exist in this extensive frame work of human activities and learning equipment. It also consists occupational works like texture, corpentry, poultry, agriculture, management of a shop, along with visualisations, games and sports, like precious cognitive forms. All these forms of cognitive domain will be partially explained by their pratical nature and the way they are being understood. All these forms, most probably contains well developed abilities. Awareness of self abilities, group works, appreciations, attitudes, willing power, descipline etc. are also exist in this forms.

2. Knowledge Vs Information

In the classroom, text books provide the information. In order to acquire this information, the child has to utilise his previous knowledge to learn about the new information and based on this he has to construct his own knowledge. At this stage, the co-operation from primary schools, text books and the teachers is mandatory, so, all of us to be alert. In this regard, it is very important to know the required information about knowledge, recaptulation, construction of knowledge and receiving / retrieving the knowledge etc., If we receive any matter from any person, book or equipment then it becomes an information. Among this acquired information, people in their own way, try to omit the unnecessary matter or modify it, and applies their previous knowledge in a suitable context in a creative manner. This process is known as knowledge construction.

As a teacher in the class room to which we have to give priority? Either to information? or to knowledge construction processes ?

In general, children will read and recite the information given to them, in the class room. They will answer the questions with the information provided in the class room or from the text books. This is generally known as 'Repetation'. But, whether this repetation helps in construction of knowledge ? Otherwise, what we need to do to make the children to construct the knowledge? What are the necessary actions we need to take to apply this knowledge creatively, in needful situations, and utilize it in their own style, instead of rott memorisation among the children ?

Think about it

Knowledge construction means unveiling the new information by the child in new situations by applying the previous knowledge by himself.

Ex : A problem given under the topic "Think - discuss" in page no. 31, 8th class mathematics text book.

Change, 0.9, 14.5 and 1.24 in to rational form. Can you suggest any easy method different from the general way of solving the problem ? This question motivates the student to think and talk a decision on its solution. Also, it encourage the student to find any alternative methods.

In case, the answers are given based on the teaching and teacher, then will it be called as construction of knowledge, in its true sense ?

So, teachers has to be like active partners in the construction of knowledge by the children while they personally participating in the process. Naturally, in the way of learning, children, construct their knowledge in a natural environment and by participating in learning activities. Thus, in such construction previous knowledge and thoughts of the children play a key role. By questioning, applying the learned information from the school in day today life, finaling the solution by thinking in different angles, and expressing their views with clearity knowledge building will take place. Knowledge is not a given by some body. It is being created. It originates from the psychological process that takes place in the minds of the children. It is of different forms, in different subjects.

Let us see the views of NCF-2005 about the knowledge building and information.

We have been considering that the systemodised experience as knowledge. It is created from language and conceptual forms and creates a meaning. As a result, it is helping us to understand the world around us. It can also be considered as a practical method or physical skills that are combined with thoughts. It leads to a progressive society by its productivity. From the civilisations, human beings have been constructing their knowledge with their unique ability to think and as an intellectuals with variety of perceptions and evaluated as a produtive and abled living being.

Children have to reproduce this wealth of knowledge by themself. It provides them some more thoughs to interact with this world with some more efficiency. So, children has to learn how to interacts with this world ? They have to actively participate in the process of knowledge prodution. They should be a part of such productivity. Here, we should not see the knowledge a product. If we feel that it a product that is prepared by human beings. Then it will be transformed in to the brain's of the children in the form of information only. In such position, the learners will be transformed into possive receivers, only. In learning, their interfearence may not be there. If you have a different aptitude about the knowledge then we an see the child as an active participant. In the nature, working with the world and respond positively to the world that they are being surrounded.

3. What is knowledge construction ?

In general, children are natural learners. They develop their knowledge by exploring, responding, thinking and analysing with interest and ease, the world around them. Also, they have inform capabilities to unveil the knowledge creatively.

It is to be felt that knowledge construction is taken place among the children only when they creatively express their knowledge which is acquired by seeing, listening, reading and expressing their experiences in a creative manner.

Constructing knowledge is nothing but learning every generation will make a seperate wealth of knowledge which they can transfer to their next generation and help to construct the knowledge. Children thus, construct their knowledge in a informal and free environment. In this process they may face challenges and by over coming these difficulties, by taking part in to the environment and society they construct the knowledge. In this process, they will search, try to explore and commit mistakes and try rectifying their mistakes by themself they will construct the knowledge. All these activities will be done very naturally and in abled way.

Meaningful learing is a productive process. It is not merely digging out the information. Thinking, expressing in a language form, conducting activities are different types of learning aspects. Children can remember so many things but may not understand them. So we have to come out of the assumption that memorisation is knowledge.

Development of concepts is a continuous process. The unveiling of knowledge will be happen through establishing relationships, finding the reasons, comprehending the situation, attitudes, emotions, values are combinded together and expressed by attaching them to the language.

Thus, thinking and language are the very importantissues in unveiling the knowledge of one self. Such thinking and language are unseperable and interdependent, interlinked. As per the language, knowledge means, children creatively exhibiting the learned, seen, read aspects and from their experiences, in the form of different processes.

This involves the processes like listening, speaking about the concepts fluently, reading, questioning, discussing and thinking, responding, expressing, appreciating and possessing high level attitudes etc.

Learning occurs in the school, out of the school continuously. It is grown through mutual interactions.

In the construction of children's knowledge, predicting, formulating hypothesis, discovering, experimenting, and questioning, discussing, theorising, responding working in the groups etc. by the children themselves plays an important role. Along with these, 'reactions' will play a major role in knowledge construction. These reactions help the child to analyse, interpret, and learn from others. In construction of knowledge, to made to think, and expressing them are very important things.

In order to construct this knowledge, children while participating personally, if teachers became a dynamic partners in their learning. Then their importance for the role of the teachers will be increasing. Learning child will always take a active participation in constructing their knowledge. The issues, like questioning, applying the things which are learned in the school, out of the school and responding in different ways to a given question, may seemed to be silly for us. But, this is the first step that makes the things understand by the learner. Generally, students will get different ideas firm their experiences or from the media. They may not express their ideas to the teachers or parents in an effective way. There will be a zone which is created in between the completely known and a little known. In such zone itself the construction of knowledge takes place. That knowledge will be transformed into skill. Thus, these skills will be sharpen while they are in the school, out of the school, in home, and while working with the community. So we need to respect such skills.

4. How does knowledge exist in Mathematics ?

Concrete to Abstract :

Every person will get the mathematical knowledge based on their 'concrete experiences'.

Ex : Let us observe an example from '3D figures'. Once thinks that how did you get the concept of 'roundness'? and think that how did you understand the concept of 'roundness' and "globe". Did you get such feeling in the beginning that 'round' is called as 'circle' and 'globe' shaped objects are called as 'spheres'?

We observe so many objects in our surroundings. We identify the shape of lemon, ball, watermelon etc. as per their natural quality i.e. "roundness". By observing such objects we feel the concept of "roundness". Based on this concept we devide the round object from the non-round objects. This property of the object is not related to any other property of that object i.e. by which matter that object is made ? What is its quantity? What is the color? Whether they are eatable ? etc., Irrespective of these other properties of the object, we identify the nature of "roundness" and thus we came to the feeling of "rounded objects" or "round shaped object". Slowly we move to the concept of "globe or spherical" shape. When we habituated to this idea of 'sphere', we slowly reduce the usage of the term 'round'. Thus we move from the properties of concrete objects to the abstract ideas.

Thus, the concept of 'sphere' slowly leads to the construction of the other concepts like 'diameter', 'readius', surface area/circumference, area, volume etc. Hence, in mathematics, the concrete concepts leads to 'abstract' ideas, and such 'obstraction' may help to develop some more 'abstract' ideas.

In the same sequence, we learn more about the inter relationships between the abstract concepts.

Ex : If the radius of the sphere increases, then the volume of the some sphere will also increases. If radius decreases, then volume also decreases. Thus, we establish relationship between radious and volume. Based on the above discussion, we need to focus on the following :

- In the given text books what concepts are given and based on which concrete objects they are being explained?
- What are the much entertaining concepts in the text books ?
- How can you that the nature of mathematics is taken in to consideration ?

5. Knowledge Vs Learning

Inspite of having 'n' number of learning theories, in understanding the complex process of learning, our comprehension is lagging a step behind. According to behaviourists every child is like an empty bucket and unwritten black board. But NCF-2005 and APSCF-2011 has unconditionally rejected that assumptions. By birth every child has so many inherent abilities. But he can not develop all the knowledge by his own abilities of he tries alot. In that aspect, APSCF felt the necessity of a programme for preparing a plan which makes the child to be a part and parcel of a teaching - learning activities. Not only that, there is a necessity of a plan to be inplemented carefully to make the learning resources like library, internet along with the parents of the child, teachers and the society around him, to take part in the teaching - learning activities. Before coming to the school, children have some hidden talents. Parents and environment will become his first colors of his knowledge. He will learn all the complex structures of the language from the society itself. Even though, a school is needed for his formal education. It is the school where the child receives the discriptic and explanatory cognitive domain. Without the dynamic interfearence of the parents, teachers, friends, in the subject like mathematics, environmental science, social studies and abstract concepts, the cognitive domain of the child will not be completed. In this regard, APSCF has rightly proposed to try all the plans for the possibility of all mutual interactions of the child. Thus, learning is a continuous process. If this system is not properly continued then there will be an immeturity taken place in education. Construction of knowledge opposes the method of recitation and memorisation among the children. Children will continue, to observe, identify and classify the comprehended concepts, which are learned from the nature along with their inborn learning abilities and express their in different ways. But unfortunately, so many teachers may not digest this truth. As a

behaviourists, the teachers lead them from one incidence to another and make wrong assumptions like imitation is possible only through learning. They treat the children as receiver of information and feel themself as the donators of knowledge. It is completely opposite to the dynamic, practical and continuous learning method. So, teachers has to remove such false assumptions from their minds in the construction process of children's knowledge. Such issues are sensibly treated by providing contextual, meaningful situations and try to remove them. Based on the above discussion, we can say the following :

1. Perfect learning happens in the child in a stress free and burden less environment.
2. In healthy learning atmosphere, children observe at micro level with great interest.
3. Critisizing, finding mistkes etc. should not happen in children's learning.
4. Children has to learn from their mistakes and rectify by themself.
5. Children applies the acquired knowledge in different situations.

6. When the knowledge construction will happen ?

a) Pretext / Previous concepts

The previous knowledge or previous understanding about the concept must be verified, if it is not exist in sufficient level then we have to develop the basics among the children.

b) Creating an urge :

Children, if they felt need of any thing, then they will try to participate for themself, and learn it, what ever the challenges they may feel. Therefore it is our duty to create such urge among the learners. As we know it very well that 'necesity is the mother of creation'. Such necesity may create great zeal to learn. It creates the interest. By improving the sentiment also we can create such zeal.

c) Mental Process :

In the construction of knowledge, the mental process play an important role. We already learned that children have the ability to learn by birth. We already discussed that every child possesses the inherent abilities to compare, classify, analysis, synthesis, remembering, recaptulate, determine, express, identifying, generalising, predicting, etc. Based on these abilities children creates somany activities in their minds.

While learning if the child involves all his sense organs in an effective manner then the neuron system by their brains will b eactivated and mutual actions, reactions, processes take place. They establish new relations and the product of such relations are being called as

'knowledge'. To activate the neurons, the child has to be undergone the emothionally, interestings programmeswith ease. As a result, so may mental processes will take place. Construction of knowledge happens. If not like that, then the learner will be passive receiver of intermation which do not effect their nerves systemand only memorisation happens. Thus, they cannot get any learning experiences. Therefore, no knowledge construction takes place.

So, as much as possible, provide the opportunities to the child to apply his internal, hidden talents and make possible the happening of mental processes. It is possible only when we provide necessary atmosphere. Children bringout their hidden talents and apply them in learning only in the stressfree, fearless and liberal atmosphere.

d) To make to think :

It is one more important aspect of knowledge construction. Instead of thinking is a general way, by make them to think in multiple way from different angles children can create can create their knowledge.

e) Along with all the above aspects, it is also importent to encourage, to provide opportunities,to make the child as a part and parcel of the knowledge construction.

7. What type of environment is required in the classroom for the construction of knowledge

> Education is not an object which is delivered by a post or a teacher. Real education is created in the child's physical and cultural fields. It will develop slowly with interaction that he made with his parents, teachers, peer group and community. Such education will be always productive and strong. In this process we need to recognise the role of the teacher, and have to be strengthen. Ecquisition of knowledge is always inter dependable. Children observes more carefully them the elders. They grasp things quickly. In creation of knowledge we need to recognise and strengthen their abilities and role. I got this much of understand only by spending my time with the kids, I can say it with my experience.
>
> **- Prof. Yashpal,** National Curriculum Frame Work-2005
> President of Working Committee

After reading the above matter, once think! We have been observing that acquiring information and tentahively storing it as a memory is believed as knowledge! Some times it is also considered as a comprehension. But in its true sense, knowledge is being created. It is

originated from once own thinking. In creating the knowledge, children show unbelievable abilities. They create their knowledge by their experiences and thoughts.

Children have been creating their knowledge from the interactions they made before coming to schools and outside the school. Inspite of questioning, by thinking, interacting. They try to expand the scope and areaof their knowledge. Infact, whether our classrooms are providing space for such processes and methods ? Really, do we have such opportunity ? Is there any provision for the expansion of knowledge of the children from their existing one? What do wo do, to make convinient of such classroom processes ? Or how should be the environment in our classrooms ? Just think a while!

Letus observe these issues from the following discussion.

a) Construction of knowledge - Present situation - Analysis

At present, the processes of in our classrooms are providing space for construction of knowledge ? Let us see! What is going on in our classrooms ? How they are teaching the concepts of any class ? We have been observing the teacher explaining concept, going and example problem, writing on the black board, explaining the solution of the problem, based on that making the children to practice it! These are the situations we came across while observing the teaching - learning activities that are taking place in the classroom. In such practices how much important is given for the knowledge construction ? How far these practice helpful for knowledge building ? Just think !

Up to now, in our schools, we have been giving information, giving much importance to the methods which make the child to memorise that information. Observing how much they learned ? etc. These issues are becoming prominent in our teacihng - learning activities. It is true that, all our methods and practices are leading towards memorising the information which is not giving and space for construction of knowledge.

> Hence, if we believe that memorisation itself is not knowledge, then we can proceed to think what we can do for construction of knowledge in our classrooms. Otherwise, if move around the stereo typed methods, we will make the tomb for the knowledge construction.

Hence, we have to agree that, in the present context, the teachers are donators of information, students are the receivers, and by strengthening and encouraging methods are taking place in the teaching learning practices. Now, it is our duty to think and come out of such situation.

b) Some incidents - their analysis

Some of the incidents takesplace in our regular classrooms are given below. Let us examine and analyse them.

Scene-1

That is 8th class. The mathematics teacher has taught the topic "Areas of plane figures" in that he has taught the concept of finding "area of a circle".

- He taught that, by drawing the circle radius on the black board, he explained how to recognise the radius, and with 'r'-radius is being denoted. The area of the circle depends on the 'r'.
- He also taught that area of the circle can be findout by the formula 'πr^2'. Based on this formula, he explained a problem and then he gave the remaining problems of the excercise as homework.

Scene-2

In another school, another teacher explained the same concept i.e. area of the circle from the topic "Areas of plane figures". Let us observe :

- Teacher has test the previous knowledge of the students by asking few questions based on circle, circumferance and about 'π' and made them to think about these concepts.
- Later, he asked the students to do an activity (by reading from the textbook), by dividing them into groups - and providing group work activity - then, the children asked to exhibit their understanding, and discussed, groupwise.
- At last, he made the children to discuss about the area of the circle and made them to understand, then unveil the principle or formula by themself.
- By probing questions related to the problem of realtime, got the concept of area of a circle and discussed it on black board and made them to realise.
- At the end, he gave an model sum, and asked the children to solve it. While solving the problem what ever the mistakes they were doing, are discussed with them and made them to rectify by themself.

From the above two scenes, which one is looking impressive? Why? In which scene, there was a provision to make the child to think? Where the construction of knowledge effectively taken place ? Just think !

At the present situation, the teaching - learning activities under scene-1 are usually taking place in our classrooms. We feel such class as common. But, as there any chance to the children to think, to participate, to establish the relationship of their previous knowledge with the current topic ? Think ! By observing the second scene it is easy to recognise the importance of childs participation and creating thinking about the concept and led them to construct their own knowledge from their perceptions.

By implementing the following methods or practices of teaching - learning process, property in our classrooms, constructive learning and knowledge building will taken place.

a) Construction of pre suppositions (Pretext)

To extend the scope of self knowledge one should have relevant previous experiences or conceptual idea. Hence, knowlede construction of the children depends upon their previous conceptual knowledge or past experiences. So, teachers have to check the previous experiences of the child and observe how much understanding they have ? etc.

Ex : How do you feel at reading the news about 'Golf'? At some time how do you feel to read the news about Cricket ? Which one is interesting and understandable ? Why ? Just think.

If you read about cricket you may better understand the news because of the previous knowledge, or having experience. But in case of Golf, we may not understand the news clearly, because of lack of previous understanding or knowledge.

Hence, we can say that knowledge is constructed based on the experiences, understanding and thoughts of a person. If such experiences or idea is not these then there is a need to form a construct such experiences. Thus, before going to read the news about 'Golf'. One should get the basic idea of the game by discussing by getting understanding on it.

So, to construct the knowledge on any topic, the teachers has to plan the teaching - learning activities after assessing the previous knowledge of the learner.

b) Contextualisation of pretext with the present textual part

It is very important to provide previous conceptual idea or experiences for the constructive learning situation. Based on these previous experiences provide the suitable learning experiences to the child to understand and construct the conceptual idea.

Ex : As per the scene-2 explained above, based on the previous knowledge of the children, we have to provide the learning activities by groups and encourage the children to discuss find and finally construct the concept.

c) Cognitive apprentiship

Teachers has to extne their co-operation and help to the children in constructing their knowledge. Accordingly to provide mathematical thinking, they have to plan and impliment some convinient learning activities, in the classrooms. And thus, they encourage the children to form mathematical concepts by themself.

Ex : While dealing the fractions, teachers write the sum of two fractions by directly using the concept of L.C.M. But, somany doubts are left uncleared in the minds of the children.

i) Why to use the L.C.M. ?
ii) What is the need of equalising the fractions ?

In leu of the correct responses to the above questions, children may lead to false belief that mathematics is a chain of uncomprehendable issues. But if the teacher explain the need of like fractions in addition of two fraction and and make them to recognise the need, to obtain such like fraction we need to take the L.C.M. concept and one activity which provide the realisation of the concept is provided, then they will do the sum easily and participate in the activities that develop their thinking. Thus, "providing such thinking opportunity to the learner is nothing but cognitive apprentiship".

d) Collaborative learning :

We already have enough discussion on the role of peers in learning. As we know children always wish to spend their time with their friends. They learn many things through their peer group. In upper primary level, they not only wish the company of their friends but also discuss their problems and try to get the remedies. Along with these we also discussed the role of interactions in constructing the knowledge.

So, the teaching - learning activities always provide aspace for co-operative and collaborative learning. That is, provide ample number of opportunities to the children to discuss, think together and speak about the concepts with their peers. For this sake, we need to provide group works. We can make them to think, question and discuss the concepts and ask them to participate as a group, to ask them to solve a problem or complete the activities given etc. Such activities provide the group learning. By these group activities, children develop the understanding appreciation on the democratic views. Along with this they may develop, collaborative learning, togetherness in thinking, problem solving and develop their confidence. Children not only with friends, they also discuss with their parents and teachers. So, not only the peer, but teachers are also the partners of collaborative learning.

e) Multiple manifestations :

We have give a shape to the thoughts of a child, i.e. what he can think individually? and they have to unveil their thoughts meaningfully. We can call it as individual thinking. In the same way, while participating in group activities and collaborative learning also. They will try to organise their thoughts. In result, they can think dynamically, and from various angles. Thus, children has to form a shape to their thinking and express them. Such unveiled knowledge consists of various interactive forms and combined with skills. Thus, the constructivism will take place in an organised manner and expressed.

f) Conclusion :

In class rooms, knowledge construction takesplace by children by thinking individually, with group, and expressing them. Such constructed knowledge will be unveild in different forms. That leads to the reception of knowledge based on the nature of different subjects. In this order, children has to confirm themself that what they have received. Then only we can believe that our teaching - learning practice are fruitful.

8. Class Room Applications

a) Construction of knowledge - Implications of the curriculum

In the system of education, teachers and pupil are very important people. In such system, all the processes and mutual interactions will effect the learning. To believe the child as a constructor of knowledge, the teachers, textbooks and teaching - learning activities has to undergo a great change. The aim education is not preparing the child for the examinations. It is to help their knowledge construction and development of according teaching - learning activities. These activities, in action provide various learning experiences. As we have already learned, children have some knolwedge before joining the school. Based on this knowledge we have to plan the teaching learning activities. Language is very important aspect of these activities. So, we need to provide learning experiences in mathematics in such way that they apply the mathematical knowledge which is constructed in the classroom in solving their real life problems. Then only, children learn mathematics with ease and with great interest.

b) Role of the test books :

Present text books are filled will leads of information and not providing any opportunity to develop the inherent skills and any sort of knowledge construction. But, education is limited to only textbooks. These is no focus on understanding the word around us, and nospace for discriminating what is good and what is bad for us. Mathematics in the classroom to treated

entirely different from the maths in real life. This leads to false beliefs and improper predictions about mathematics. In this context we need to understand the role of text books. We need to identify the key issues like what values to be introduced to the children through text books? How to prepare text books that are very much useful the learner ? etc. There must be clarity on these issues in the curriculum. Because, we know that text book is an important tool to implement the curriculum. These books plays a very prominent role in guiding the teaching - learning activities to achieve set aims and objectives of education.

In our society there are somany oral, other than oral traditional arts exists. These arts exist in false logic, antique and unwritten form, in rock-bottom social groups of tribes, communities and women. All these arts must be inscribed in our curriculum. By doing this, their door of thoughts will be opened. Thus, ample number of solutions, skills and abilities can be developed. Thus, we can contribute for their advancement, modernisation and their complete development. School is distinguished for the literate, but it should not neglect the illiterate and traditional. So, priority must be given to all types of oral skills, traditions and arts.

- NCF 2005, Page-84

In this view, APSCF-2011 has made some propositions about text books :

- The learning of children should not be limited to the text books.
- text books has to provide ample number of opportunities to the past experiences, previous knowledge, proper utilisation of the internal abilities of the child and to work with the local environment.
- The text books have to progress to reflect the scientific practices like conceptual idea, along with work experience, indigenous arts, literature, fok sciences, and social awareness and thus, text books have to be modified.
- Children have to understand the methods of knowledge construction, and their proofs based on principles of reality. For that sake, the text books has to be very much helpful.
- The social principles of different groups of the society, and their methods of knowledge must be reflected in the text books.
- Social background of the back word and supressed groups, culture and traditions must reflect in the text books. The conceptual acquaintance of the well-to-do groups should not be rubbed on these communities. Text books, in this regard, have to extend their attention towards all these issues.

- 'Text books should be child centered. This feeling should not be decorative. If the total educational plannings child centered then their interests, attitudes, aptitudes, learning styles, and their roots, their background of the children should be key points in developing the books.
- The text books should be activity based. Teaching based on activities should not remain as traditional. Most probably the present activities are looking like mechanical process. Inspite of developing, thinking, the activities are implemented by giving home work, reading the text books, or copying from the previous works or throwing the equipment before the learners etc. Visually, activity must create thinking and reflect the realistic features through meaningful learning. Activities should find the cause and effect and used as tools of prediction. According to the state curriculum frame work and aims of state education means to give respect to the concept of co-operation, peace, values and human rights. So, the text books should take care the implementation of human rights and accumulate the ethical behaviour among the children.
- Children should udnerstand the current situations. They need to understand and anlyse the problems given in the communication media. Text books should encourage them in this aspect.
- All the sectors of the society must be developed by education. The content information provided in the text books should belong to, or related to a particular community. It should not be against the feelings of communities like unprevilaged groups, women, children with special needs, all minority communities.
- In present context of globalisation and privatisation education becomes a commercial activity. People are looted by attractive advertisements given in the name of quality education. The main problem in the present situation is whether such education prepare the child for the welfare of the society and whether it prepare him/her as a responsible cotizen who can work for the welfare of the society ? or only prepare them as engineers, doctors, or any other employees ?

A corpenter makes an object by understanding the value of the object in society, i.e. (social, cultural, aesthetic, economical values) and by using his creative skills in his hand work. In preparing such object he possess the knowledge about availability of material, quality in manufacturing, feasible cost of the material and production. He also posess the knowledge about marketing resources, from the begining to ending, the plan of requirements and implementation, utilisation of self

skills, utilising the skills of others in a proper way, administering the required tools and equipment, etc. Finally he will be in a position to determine the quality, creatively, excellency and best productivity of the objects.

In the same way, the game like kabaddli, possess the qualities like requirement of physical strength and fitness, knowledge about the rules of the game, knowledge on self strengths, plan that can express the physical skills, co-operation of the team, estimating the strength of other teams, and knowledge to prepare a game plan that result in winning etc.

- NCF - 2005, Page-26

How should be the teaching - learning activities ?

Application, utilastion and sharing of knowledge takes place among the children of same age group with like experiences and previous knowledge. They get the understanding through discussions among the group or by self, and move forward. They can make possible the forcasting of cognitive aspects. They habituate to rational aptitudes and conceptual idea by knowing the reasons from posing various questions. They habituate rational thinking to express their understanding about cause and effect relations during the discussion. Because of such methods children develop their own understanding and thus construct their knowledge. In such method of "complete change" the role of teacher is indispensable. He should observe the children by participating with them and encourage their explorative questions, lead their discussions and clearity their doubts. He should be like a friend, philosopher and a guide. He has to participate as a fellow being in their acitivities, make them as his partners and express his views by his partnership attitude. Then only a teacher become a researcher, co-operative member and facilitator to the learners.

Need of 'reflective teaching' in the process of knowledge construction :

John Deway had explained the characteristic features of 'reflective teaching' as follows :

1) **Aims and consequences :** Relfective teaching cast the students to have direct relations with aims and consequences and prepare them technically sound.

2) **Cyclic Method :** It posesss the methods of concentric and spiral in teaching. In teaching evaluation must be a continuous activity and leads to the revision in its own way.

3) **Competencies of inquiry in class room :** One should be abled to adapt the competency to inquiry method. It contains the activities like collection of data, analysis, evaluation, reinforcement, preparing a plan, and providing facilities etc.,.

4) **Attitude towords teaching :** For reflective teaching one should have greater conceptual attitude and responsible, complete heart.

5) **Teachers' Judgement :** Effective teaching always depends upon teachers judgement ability. Also, it is partially depends upon the interospection and self reflections of the teacher which are desired from his discipline.

6) **Learning with colleagues :** Through the conversation with friends and from their co-operation, the reflective teaching will gain completeness along with professional, learning, and individual completness.

F) Critical pedagogy and its implications

Critical (Analytical) method of teaching helps the children to ask questions by limiting the domination that posed on them, and tries to clear all of their doubts and false belief. It also creates critical awareness among the learners. According to Ira Shore (1992), "Inspite of limiting to read and write, a student can think critically and actively beyond the level of meaings. He will come out of the misconceptions and imaginative concepts and improve his wisdom. So, every student has to understand the internal meanings, elementary reasons, social situations, consequences of any particular activity / incedence, objects, incdents, processes, experiences, plans, contents of the lesson, rules, multimedia or about the transactions, compulsorily.

One of the important aims of cricial padagogy is preparing the child efficient and powerful, providing freedom and relieving him from all types of burdens, and dipressions. In the knowledge construction process of children, the scope of traditional teaching methods in very limited. Respectin the culture of others, observing critically, the world around him by himself are some of the aims of education. Critical pedagogy must help the child to understand and respect the cultures of indegeneous and under previleged groups of people. Then only, the children from backward classes, under previlaged groups, will learn their cultures, history, vividness of their manners, religion, heridity etc., thoroughly. This will lead to inheritance of values and effect their lives. Thus, helps them to become abled in the society. Education is political. This critical pedagogy will alert the teachers and students towards the political tremsections that revolve around their education sytem. It empower the children to understand the political concepts and energise them to understand the society.

Implications of Critical Pedagogy :

- Critical pedagogy woks as a stratogy for knowledge construction.
- Reflective thinking skills, critical thinking skills, thinking skills of language difference related skills, play a vital role in critical pedagogy. Teaching - learning activities must lead to the development of such skills and it should be applicable to all subject.

- Teachers must know that living experiences, and self context of education among the learners plays a key role in knowledge construction.
- A good system of education or a school will not criticise the failures of the children and their broughtup knowledge in the class room.
- There should be a great respect between the feature and his taught.
- Learning must happen between teacher-taught-teacher i.e. teacher's also a learner and learner can also teach. We have to perceive in this way.
- Teacher has to dedicated, respectable towards his profession.
- It is very important to the teacher to know the culture, previous knowledge, and language abilities of his student.
- Teacher must be always like a researcher and intellect.
- Aggregated learning is a method of problem solving. In this, identifying the problem, exploring the ways and means of solutions, preparing executable plan, its execution, and evaluation are very important activities.

g) Social Constructivism :

Social constructivism is an understanding the theories of socialogy. It will apply the general philosophy of knowledge construction to real life. Students by gathering into group, construct a small partnership culture and understanding among themself. Whenever the child involve himself in such culture, then in various stages, he learns to become a partner of that culture". - said by Lev Vygotsday (1896-1934)

For the sake of the implicatios of teaching - learning activities, our psychologists has conduct a research on the concept of social constructivism. Constructivism is a prominent thoery among the theorise (behaviorism, social learning, social construction) related to the achievement of progressive development of the child. In depends on Jean Piaget's theory of cognitive developmen. The "theory of stages" (four fundamental stages of development) proposed by Piaget is identified as constructivism itself. Because children has to construct the understanding of the word by themself. By adapting the culture along with other aspects of social constructive development, constructivism has formed as social constructivism.

Piaget had agreed unonimously with the concept of children's constructivistic nature which was explained in Vygostsky's white ups like "Mind in Society" (1930, 1978). Thought and language (1934, 1986). Based on this social constructivism only, the concept of child centered class in teaching learning has formed. Conducting group discussions in the class rooms, have somany advantages. Based on this a child can develop strong foundations on generalisation, learning transformation in the class room and oral communication of concepts. Discussions lead to the development of social and group skills, motivation and problem solving abilities. Such

type of learning fix the learned concepts in their minds of students and does not allow to forget them.

h) Role of the teacher :

From the above discussion we come to know the construction of knowledge, and their situation. Constructive learning means, leading the learning situations to the construction of knowledge. In this process teacher plays a very important role. He is the partner of all the activities that happen in class room. He should not be ideal only as an instructor, conductor, and the man of giving information. He has to provide a suitable environment for the construct of knowledge among the learners. He has to encourage, participate with them and make them to involve by all their senses. He has to look after that children should participate according to their interests and involve in learning activities. But, unfortunately, in the name of objectively the leave the simplicity and creativity. They sometimes, feel that except the answers given, in the text books, all the other answers are wrong and they argue that how to accept the multiple types answeers. This type of argument ruin the purpose of learning.

Our teaching and execution is limited to lessonplans itself. It is also only for the sake of proper using the achievement behaviour. From this view, we treat the child as a living organism which is to be trained or a computer which is going to be programmed. As a result, all the concepts in the lessons are compartmentalised iinto seperate boxes and made them to memorise or by providing some of the activities and testing their memory etc. is happening. The entire teaching process is limited to Herbertian teaching steps and become stereo typed. This method has to be changed.

Teaching learning process must be filled with activities with respect to the interests, level, and variety of the children. It is should be with proper planning to make the child to participate in the learning. In this regard there is a need to prepare suitable plans by teachers, to make the child to think, face the challenges, and to know how they are learning to the child itself. Prohibit or avoid the stereo typed recitation methods in the class room. Lessons have to be prepared for involving all the students by providing individual tasks, group activities and activities that involve entire class room. These should be ample number of provisions for the children to express their ideas freely along with mutual interactions.

Teachers should not be authoritative in the class rooms instead they have to respect the feelings and openions of the children and listen to them carefully. If the children feel free and without fear to transact with the teachers, then they learn by themself quickly. They have to question their knowledge which is provided by the books, teacher, critically. We should make them to habituate to the critical aptitude by making them to interpret the knowledge that is available around them, and compare it with their experiences. In accordance with these aspects we must plan the lessons and prepare unit plans. Modify the stereo typed teaching learning process to interesting life making, concept building strategies.

Approaches of Teaching Subject

Nature of Mathematics - Childrens Learning :

Introduction :

Mathematics is originated from the result of human mind which can obtain the obstract concepts from the real life. It take the concept of 'counting' which is originated from the above said conditions, we may not find any relation between the objects and the numbers that we count. Mathematics is science of numbers and space. It is not only limited to abstract concepts. It can produce some more abstract concepts from these concepts.

For example, natural numbers, even numbers, odd numbers, prime numbers etc. are generated from the basic concept called 'number'. Thus, mathematics is a reflection of human mind and it is born from the experiences of human life but its growth and development may not depends upon the same. It depends upon the creativity and logical thinking of the human mind.

Why Mathematics :

Mathematics is an expression of human mind, it reflects the active will, deep thoughts, and complete mathematical desire of aesthetic achievement of man. Mathematics is based on logic and intution, analysis and synthesis, generalisation and particularity. We may not observe it as mathematics is a part and parcel of our life. For every person, to count, to arrange in order, to purchase the goods, providing discount, rate of interest etc, mathematics is necessary. Also, mathematics is necessary for the development of science and technology. Even mathematical

knowledge is mandatory for all occupation wiz., corpentry, pottery, masons, and street dwellers etc.

Ex :- For those who are working in constructions, mathematics is needed for their planning, to prepare algorithm, and also they need to copute the area and numbers inspite of computing related to 'space'.

Nature of mathematics

a) Mathematics is an abstract idea :

Mathematics is abstract science. It is a combination of so many abstract concepts. But, here we need to understand some thing that whether every abstract concept is mathematics ?

Ex :- If you observe the 'concept of numbers', and four fundamental arthmetis operations wiz., "addition", "substraction", "multiplication" and "division" which are operated on this numbers are all of abstract in nature. Based on these abstract concepts, even, odd, and primary numbers are being evalved. Thus, based on one abstract concepts. Some other concepts of the same nature are formed.

In general, some times we feel that there is a need to introduce this abstract nature of mathematics in primary level itself. But, some concepts are to be introduced and made understand at higher level itself.

Ex :- In primary level children may have an idea of volume and quantity of liquids that contained in a vessel. Based on the quantity of the liquid that can be filled in a vessel, we can estimate the volume of that vessel. This practice is given in primary level by providing different activities.

Ex :- In 4th, 5th standards, it is already taught to express the quantity of a water bottle, cooldrink bottle, and a minute measure of a bottle neck. But at such level student may not know how to find the volume based on their measures of their shape. For that, first of all we need to discuss the concept of "volume of a cube and cuboid". Accordingly "volume of any three-dimensional figure is always being expressed in square units", such conceptual understanding must be made. Thus, after understanding the abstract concept of "volume" we will discuss and to find the 'volume' of different three-dimensional figures. Then we propose a formulae for each three-dimensional figure.

Ex :- Volume of a cube = a^3

Volume of a cuboid = lbh

Volume of a cylinder = $\pi r^2 h$

b) Mathematics has its own logic :

Whether mathematics is only based on abstract concepts ? Let us see 4 x 3 = 12. By reading this surface, an abstract idea be striking in our mind. But whether this sentence merely giving us, only the abstract idea ? Here, 4, 3, 13, x are the numbers and symbols of mathematics, as we know mathematics has its own language. This language is formed based on the logic as well as abstractness, like alphabets (A, B, C....) in English language. The only difference is the former has logic along with abstractness but in later, there may be no need of any logic. For example, if you observe 4, 3, and 12. These numbers are taken from mathematics language. But when you say 4 x 3, immediately we will get the idea that it means 3 + 3 + 3 + 3.

So, 4 x 3 = 12 is a mathematical sentence and it is made based on a logic. Thus, every 'abstract concept' of mathematics is made up of a logic.

Mathematics is not only a concept of "numbers", it also a glossary of geometrical concepts like square, circle, rectangles etc. Metre, centimeter, kilogram, litre, second, hour, etc. measurements are also there in mathematics. All these abstract concepts are made only based on some 'logic'.

c) Does Mathematics have the nature of Applicability :

Mathematics has another characteristic, i.e. It can solve somany 'problems' in our real life. But, unfortunately, now a days we have been observing so much gap between the 'class room mathematics' and 'mathematics in general life'. In fact, from the early hours of the morning, mathematics is being used, begenning with a Sunshine to our bed time, and our life is completely interlinked with mathematics. In that, mathematics and problem solving became a part and parcel of our life.

d) Mathematics gives us pleasure and entertainment ! :

Mathematics provides us lot of 'fun' and entertainment. When compared to other text books we feel pleasure to solve puzzles and games. What is the reason for this ? Because, pleasure is there in mathematics. When an abstract concept, which consists of some logic, is solved by identifying the logic we feel so much of pleasure.

By observing the above facts we can co-defy the nature of mathematics as follows :

- Mathematics is abstract. The important nature of mathematics is to bring out the abstract concepts from the real life experiences.

  Ex :- In order to count the concrete objects, the abstract concept of 'numbers' is forming.

Ex :- Understanding the numbers is compulsory for counting. If you keep some pens in a place and ask a child to pick a pen, or pick two pens, then what does he do? Similarly if he is asked to pick up 5 pens, then what will he do ?

This activity can be done only by "counting" itself ! Here 'pen' is a concrete object even though for counting we are adding the abstractness in the form of '1', '2', and '5'. In another example, by providing a garland of 5 beeds to a child and ask him how many beed are there? Then he starts counting from 1, 2, 3, 4, 5 and say 5. That is according to the order of the beeds, he assigns the number and then counts. At last by assigning '5' to the last beed he says "there are 5 beeds in the garland. In this process, he generalises that if 1 added to another one then the value "increases". Thus, from these concrete objects he understand the 'abstract' concepts.

- Mathematics is not only limited to few abstract concepts but it forms more abstract concepts based on these abstract ideas.
- It provide an opportunity to understand the abstract concepts like "spaces" from the shape and structure of concrete objects.
- Through 'Inductive reasoning' mathematics provide the ability to generalise from the particular instances among the children.
- Apart from its inductive reasoning, to prove the mathematical statements as true and to determine the results, it gives 'deductive reasoning' also. Through 'Deductive reasoning' mathematics proves formulae, theorems, axioms etc.

  Ex : Observe $a^o = 1$

$2^4 = 16$	$3^4 = 81$	$10^4 = 10000$
$2^3 = 8$	$3^3 = 97$	$10^3 = 1000$
$2^2 = 4$	$3^2 = 9$	$10^2 = 100$
$2^1 = 2$	$3^1 = 3$	$10^1 = 100$

  Observe the above sequence. What do you identify ? If ou observe the sequence that is having 2 as base, what happens in that sequence? "By reducing the exponent by 1 the value of the number becoming half of it."

- Then $2^o = 1$, also $3^o = 1$, $10^o = 1$, hence, if power/exponent of any number is zero then what happen?

"For any number if the exponent/power is 0 then its value is equal to 1" is being generalised. In this instance, some of the examples are given. Based on the "General rule" of the given

example some results are being derived. Based on these results some generalisation has been done. This way of doing is known as "Inductive thinking".

But, here the generalisation "if the exponent of any number is '0' then its value become '1'. Is it correct? Then what is the value of 0 and 1? In this instance previous truths that are proved will be hindered. So, for the basis 0 and 1, the notation $a^o = 1$ become false.

At last, it will be defined as $a^o = 1$ (when $a \neq 0$, $a \neq 1$). In the second instance, "the Generalisation" of truth is being tested in different situations. Thus, if the generalised truth is applied to different instances, such method is called as "Deductive thinking".

So, from the above example, we observe that by the combination of "deductive thinking" and "inductive thinking" a formula/rule is formed. Mathematics will develop the ability to solve the given problem in different mthods.

Mathematics VS Nature of the children :

Children those who are coming to school are not like a plain paper or cupty slate. Abilities like classifying, comparing, estimating, analysing, drawing figures, generalisaing, questioning, giving reasons, etc are inherent in the child. Before coming to the school itself, they have some basic idea of shape, quantity, state and apply the concepts like geometry, space and number. So, children have natural desire to learn mathematics. That why, they always question the phenomena around us why and how they happen ? They accept the challenges if any. They frame rules. Do the oral calculations, solve puzzles. Thus, based on their experiences they learn in different ways.

Nature of children - Mathematical Achievement Ability

- All children can learn mathematics.
- All of them posses the natural curiosity. They question how the things happen ? Why do they happen ?
- They learn through reading, doing, discussing, questioning, observing, studying, playing with twisting problems, thinking, and responding etc.
- They also learn by interesting with other children inspite of learning by themselves.
- Children apply the mathematical knowledge acquired in the school in their real life.

Objectives of Teaching Mathematics

Some people estimate the value of mathematics by the amount that mathematics being utilised in their life. Some other feel it as a tool to improve their thinking ability. It may be

studied by people for enjoying the pleasure of its logic. Considering all these aspects, the objectives of mathematics is being determined as follows :

- To develop understanding, skill among the skill on the concepts related to number and space given in the curriculum.
- To develop mathematical thinking among them.
- To continue their exploring from their assumptions to logical decisions.
- To understand and proper utilisation of abstract concepts.
- To develop the problem solving abilities in students.
- To obtain the information given in a problem by understanding it properly.
- To interpret and analyse the results by them.
- To apply the results to different phenomena/problems or for generalisation.
- To develop confidence among the children for proper utilisation of mathematics.
- To habituate to prepare different techniques / strategies for solving the problems.

Mathematics - Vision

- Children learn mathematics happily and with ease by forgetting the fear of mathematics.
- Children know that mathematics is more than principles, mechanical methods and great.
- Children percieve mathematics as a great thing to discuss, develop conversation, to work together and as a tool to express their feelings.
- Children find the solutions and frame meaningful problems.
- Children uses different abstract concepts of mathematics, to find rebitions, to know the internal structures, to find cause and effect, to determine the truth values of a given statement.
- They grasp the logic involved in problem solving.

Knowledge in Mathematics - Its construction

In our life we have been facing different experiences from different children in different situations.

Do you feel that children start learning different things from their childhood? Or else, "As denoted by Russueo the mind of a child is an empty slate (Tabular asa). In school itself we have to write every point on it, and make them to learn every thing".

Infact, children learns from every work that they do, every thing that they handle, each and every thing, they came across. They learn so many things before joining in the school itself. They also learn in school, and out of the school. If we feel like "children learn every thing in the school itself", then our feeling about learning is aboslutely wrong. If children play the game of snakes & ladders, we feel that they are wasting their time of studying, but we will not understand that the number systems are being conceptualised and recaptulation, reinforcement is being done. Through the game, they learn a logic.

Let us see another instance. Before the schooling age (2-3 years) or during the period of preprimary education (3-5) years, if a child recite the numbers from 1 to 100, we feel very happy and high. But does it mean that he really learn the numbers ? Can he/she count 100 objects ? Whether he identify the difference between 50 & 100 ? If they failed to remember we will shout on them like whether they had forget counting and put pressure on their brains. But children learn from their experience and from concrete objects.

Is there any need to make the child to understand the idea of 'half'? or else, they learned it by themself ?

Children learn the idea of 'half' from their own experiences, natural abilities, and in an orderly manner. They give self definitions to the ideas that they made or from solving their real life problems. For example :

Finding 8+6 can be done in the following ways.

8 + 6 = 8 + 2 + 4 = 14, or

8 + 6 = after 8, counting 9, 10, 11, 12, 13, 14 = 14. (counting from 8 by six numbers upto 14 and say the answer as 14), or

8 + 6 = 1 + 1 + 1 + 1 ..... (8 times) + (1 + 1 + 1 + ...) (6 times) = 14.

In another example, teacher, while teaching the lesson on 'subtraction' in order to make them understand the idea of 'subtraction' gives a problem as "if you buy an oil packet for Rs.65 and give Rs.100 to the shopkeeper, then how much amount you will get back ? A child may solve it by taking 65 + 5 = 70 + 30 = 100, and she/he may give the answer as 35. Because, that child, in the beginning, may add 65 to 5 as 65 + 5 = 70 and then 70 + 30 = 100, thus, she may solve it. But the teacher expects that the child will solve it by doing 100 - 65 = 35. We will stop them doing in the above method also.

By doing this way we are bonding their ability of "reflective thinking". Child may get the notion that the method taught by the teacher is only the correct one. In result, the students are

becoming receivers of knowledge and information by suppressing their natural tendency of dynamic thinking. Hence, children construct their knowledge by adding their experiences to new ideas and by understanding them. In that process, they do question, observe, and verifying. They may unvail a new idea in this process.

Motivating, creating interest towards mathematics

We may not observe the existance of mathematics, in and around us. Street children in cities, poor children in villages will frequently participates in somany money transactions. Through out this world in every noole and corner, children have some touch with mathematics before schooling itself. But, any curriculum of any school did not provide any scope for such "street mathematics". Thats why, mathematics is compartmentalised as school maths and out of school maths.

Generally, we feel that it is not possible to establish relationship between school maths to our life styles. But it is not true. We will understand it by the following discussion.

- Road side vendors, carpentors, masons uses so much of mathematics, even they do not have any school education. To do their works, they may require the calculations of areas, numbers and some times they need the calculations related to spaces.
- The traditions like 'arts' and 'Rangoli' in India not only looks beautiful but they involve a lot of mathematical knowledge to learn.
- There are somany valuble internal relationship between 'Arts' and 'architecture'. We can observe it in our sorroundings.

By observing the above information we find mathematics can be learned by doing and utilising it. This utilisation wil happen witout any stress, contextually, by linking it with own experiences, and by discussing, observing, and calculating. Thus, mathematical knowledge develops in our mind unconditionally.

c) Strategies of Teaching and Learning :

As per the suggestions made by State Curriculum Frame work - 2011, text book of mathematics are prepared. These text books are intended to make the children to learn by thinking, discussing in groups, discussing with teachers and by interacting with the learning material, also for their self learning. Instead of the traditional methods which assumes that "teacher teachers, child learns by listening to him", importance is given to the ideas based on scientific teaching methods, which assume that child has innate abilities and talents. They can do any thing if they are provided with ample number of opportunities. They can solve the

challenging problems etc. In accordance with this intention while constituting the chapters, activities, excercises, puzzles, games, real life instances, needs, mathematical skills etc. are given in the text books. To made the child to know how far the learning happend in him, to acquire mathematical skills, to understand the concepts extensively, convinient excercises and examples, illustrations are given in the text book.

So, for teacher it is easy to achieve the set academic standards when they use the text book efficiently, by understanding the concepts, for teaching - learning processes. For that sake, teachers has to implement the teaching strategies as discussed below.

Complete Class work / Activity :

In the class room for the better understanding of the concepts to the children, teacher has to conduct and ample class activity. For understanding the concepts of text books real life instances, activities, patterns etc. activities are given. Conduct the activities in the class room for child participation and understanding. To make the children to participate completely or make them involved in the activities, teacher has to discuss about the activity, role of the students, difficult or new words and symbols in the presence of total class. Then only students voluntarily participate in the activity. Also for solving problems and making the students to understand and to do the excercises by themself it is necessary to discuss in the entire class.

Thus, the teacher has to conduct all discussions about concept, examples, understanding problems, given under exercises, and learning processes, as complete classroom activity. By writing the important concepts and questions on black board, make them discussed by entire class. These type of examples, discussions will develop understanding in children.

Group Works / Activities :

While executing the activities in the class room, teacher will divide the entire class into different teams. Also, problems given under "Try this" heading, "Think - Discuss" activities are also provided under teams. All these items are discussed in their teams and they express their openions. They try to achieve the academic standards by accepting with others openions. In such a way, teacher encourages the children to learn in teams and acts as a facilitator and implements the teaching learning activities.

For instance, let us observe the problems given under the heading "Try these" in the chapter of "Square roots - Cube roots".

i) Is 81 a cube number ?

ii) Is 125 a cube number ?

Inspite of asking the students to solve the problems on squares and square roots directly. Teachers should discuss, what are the square numbers ? How to write the squares for given numbers ? Whether given number is a square ? Then they solve the problems on square concept. Similarly, discuss what is a cube number ? How cube numbers form ? Given in page no 139, by an activity. By understanding the above discussion, students understand the square numbers and try to solve the problems viz "why 81 is not a cube number", "125 is a cube number", given under the heading "Try these" with their groups, by discussion. For that necessary co-operation for discuss in groups should be provided by the teacher.

Individual Activities / works :

Students do the individual activities to know their performance in solving the problems based on the discussion with their friends and teachers. They try to solve the problems by themselves, given under the topic "Try these". Teachers has to encourage the children for such type of learning. Students can demonstrate or can explain to other students.

For example, in VIII class, students has to solve the problems by themselves, after understanding the concept "Phythagorian Triplets" given in the chapter "Square roots - Cube roots."

Observe the following :

(1) $3^2 + 4^2 = 9 + 16 = 25 = 5^2$

(2) $5^2 + 12^2 = 25 + 144 = 169 = 13^2$

So, (3, 4, 5) and (5, 12, 13) are called as Phythagorian triplets.

a, b, c are any three positive integers, then $a^2 + b^2 + c^2$ then a, b, c are called the phythagorian triplets. If a, b, c have no common factors except then (a, b, c) are called as "primary triplet". By understanding the above concept will solve the problems given under the heading "Try these".

Try these :

(1) Check whether the following numbers are phythogorian triplets.
(i) 2, 3, 4 (ii) 6, 8, 10 (iii) 9, 10, 11

(2) Take a phythogian triplet and wirte their factors. The triplets formed by these factors are phythogorian triplets or not ? Verify.

Project Works :

Project works are the combination of different activities. Give the project work as a home work. Before giving the project work, students are being properly understood. Depends upon the nature of project its should be provided as individual or group work. While giving the group work, 'how many members are there in the project and what are their responsibilities ?' they must know. Teacher should provide suitable tasks and allot their responsibilities. After completion of the project work students are asked to demonstrate their work. While demonstrating rectify the mistakes if any and give necessary suggestions and indications. After completion of project work students are asked to write a report on how did they complete it. In such report they have to write the details of numbers members in a groups, their names, responsibilities, the method of collecting the data, items that are present on that project, findings of the project, etc. Examples, let us observe the project work given under frequency distribution tables, line graphs in 8th class mathematics text book.

In this chapter, students solve the problems related to Arithmatic means, in different methods. They came to know how to calculate the arithmatic mean from the ungrouped data ? and what is meant by arithmetic mean. So, to find how they are going to apply this concept in their lives by giving a project on this topic.

Project :

Collect the information of marks obtained by any 10 students of your class in different subjects. Then write the arithmatic mean with respect to each subject with out calculation. Then verify it by doing it in a proper method. Verify how many arithmatics means that you have predicted are correct.

Teaching strategies to be followed to manage/organise :

1. Organising Excercises under "Do these".

The problems given under this heading are sovled directly by using the concepts. All the problems of these exercises must be solved by individual students. They should not copy from guides or other's note books. In the same way, teacher should not solve them on the board and encourage the students to copy them. First of all, students should understand the concept well before they are going to solve individually. To solve the problems individually by themself, students are taught understand the steps involved in problem solving i.e. - Reading the problem statement with comprehension, - understanding the information and dividing it into parts, or wholly. Subdividing the concepts, understanding the logic behind the concepts of the problem.

Select a suitable method to solve the problem, using that method solving the problem, verifying the result. Thus, students are made to think and practice to solve the problem. Accordingly, necessasry care has to be taken to made the students to solve the problems under "Do these" in the class room itself. Observe the students while doing the sums, rectify the mistakes by discussing and encouraging them. (Discuss about the excercise, first in the entire class then ask the students to do it individually).

2. Organising excercises under "Try these" heading :

Problems under this topic are little bit difficult. They help to deep understanding of the concepts and also help to achieve the desired academic standards. That means, they help the children to develop reasoning, logical thinking, expression, using mathematical symbols and skill related to these aspects, etc. So, these problems may not be solved by individual students. Teachers co-operation is necesssary. They should be dicussed in groups. If they are being solved in groups, teacher has to go to the groups and observe that how they are solving? How they are discussing ? What are strategies that they adapt ? Whether they are committing any mistakes ? etc. suggest them when ever it is necessary and try to achieve the academic standards. These excercises have weightage of marks in Formative Evaluation.

3. Organising teh exercises under "Think-Discuss" heading :

The activities and problems given under this division are helpful to extensive understanding of the concepts by the students. These are all compulsorily discussed in groups and thus, they are to be encouraged. Ask the students to demonstrate their understanding before entire class.

Teacher responsibilities in organising Excercises

In every unit of the text book as per the concepts to be discussed, there are 5 to 8 excercises. In every excercise there are 10 to 15 problems are given. Problems given under this excercises are not alike. These problems are based on the concepts that are to be learned by students and they help to develop the skills of applying the knowledge acquired in real life, logical thinking, expression and representation. All these excercises must be done by the child by himself. In this regard, teacher has to book after the children to discuss the problems understand them, and do them as homwork. All the problems must done by the student by himself and not to copy from guides, other student's notes and problems solved on the board by the teacher. Whether the mistakes that the child committes while solving the problems, must be discussed with them and rectified. It is better to discuss such mistakes on the board for entire class in order to develop awareness among the other children. Encourage the children to rectify the mistakes by themself.

By implementing different types of teaching strategies and conducting the activities/works/ excercises execute the teaching - learning processes in class room and make the students to participate in all the above activities.

Excercises - Guides - Copy writing :

In the strategies that are needed to conduct excercises, we have discussed the responsibilities of the teachers, tasks that to be done by the children. The chief aim of this discussion is to make the child to develop self learning ability and demonstrate the desirable academic standards by themselves. That is, solving the problems given under the excercises personally, by using the mathematical concepts that are mastered. All these solutions must be written in the note books of the child whether it may be a class work or home work. At any cost, they should not copy from guides, other students note books, etc. Teacher has to check the note books regularly and of the answers, explanation, are similar in any two books then he should ask the explanation and inform the students that they may be rejected, and worn them not going to get good marks in evaluation. Encourage them to solve a problem in different methods and encourage their genunity, honesty. As a part and parcel of CCE encourage students to solve the written problems. Precautions should be taken care while giving marks for their written work, if more than one book contained the same problems, method of solution, explanations, answers then marks should not be given for them.

Teaching Steps

How to teach Mathematics :

The teaching learning activities are to be held according to plan. Every period should be conducted according to steps. By doing so we achieve desired competences. How many periods are needed to complete an unit ? In any given peirod what concepts are to be made understand. What standard of education is to be achieved ? In a period consisting of 45 minutes how teaching learning activities are to be conducted ? How to make child learn ? These goals can be achieved only when teacher conducts the teaching learning activities in a planned systematic manner. We are about to learn these teaching steps in this unit.

All the students are to be made to participate in teaching learning activities. This is a challenging task for any teacher. To achieve preset goals one should plan before hard with constructive thinking, and organise the teaching learning activities with systematic steps. Then we can achieve all aims and objectives overcoming the obstacles in the path. Let us explore the steps involved in lesson plan.

I. Lesson Name .....
Write the letter name / chapter name that is to be taught.

II. No. of periods ....., Teaching duration / Time.....

- should write number of periods that are needed to complete topic that is choosen in lesson plan.

- How long the lesson is taught to be written also the period starting and ending time is to be mentioned.

III. **Teaching topic :**
should write the name of the teaching topic related to mathematics.

IV. The Academic standards achieved by teaching the topic of lesson :
(1) Problem of lesson :
(2) Stating reasons - proving results
(3) Communication
(4) Connecting
(5) Representing - visualisation

In the lesson that is taken up by the teacher in mathematics. He/She should recognise how the above standards are achieved in students and write the same.

Introduction :

(1) Greeting the children (affectionately)
Teacher should greet the children first not otherwise. By greeting affectinately and discussing about their difficulties. Children realise that teacher has concern about their welfare and he/she exists only for them.

(2) Testing Previous Knowledge / Testing Previous Concepts

- Teacher should test the knowledge and concepts that are required for present lesson. These are naturally students should have learnt previously. This is done by using the following :
- Previous experiences of children/any situation/incident/real life incident/activity games etc. or mind mapping /brain storming methods can be utililsed.

(3) Announcement of the topic :
While discussing the topic about to be taught the student should declare the topic. This helps the students to know what lesson they are about to learn on that day.

(4) Need and relevance of the topic :
The concept / topic which students learn in the class room has application in real life. The teacher should make students to realise how this topic is needed for them in real life, and highlight the need to learn the topic.

(5) Teaching learning material :

To teach the lesson / for exhaustive understanding of concepts appropriate teaching learning materials are to be prepared and make students to use them in class room.

(6) Presentation and Discussion :

(1) **Reading :** Children should be made to read the content from the text book (which are about to be learnt in the lesson). Children are to be prepared to identify the keywords / technical words / non-comprending concepts / symbols. Teacher illustrates these on black board while discussing with children. In this way the understanding is to be developed.

(2) **Activity for understanding the concept :** The concepts are to be understood by the children in depth and extensively for their purpose activities are to be conducted and it should be ensured that all students take part in it. The concepts are to be discussed with children by putting thought provoking questions.

(3) **Problem solving :** The children after understanding the problems are now ready for stepwise how to solve should be illustrated by writing the problem on black board and discussing the solution with children understanding towards solution to be developed.

(7) Model problem solving :

- A problem identical to be solved in the earlier step must be written on black board and make students to solve individually.
- Once the students solve the problme they are to made into groups of three / four and allowed to discuss the solution.
- Teacher should observe the mode of discussion in groups by children.
- If small errors have occured in solution they are to be rectified by children under teacher guidance and encouragement.
- If on the otherhand larger number of errors have occured in solution the problem must be written on black board and the problem should be made clear through detailed discussion.

(8) Recaptulation :

The concepts / points learnt by students during that period are to be revised and recaptualted. By their we mean learning points are discussed are by one through techniques

such as mind mapping and writing those points on black board recaptulation should be done. Teacher can list all the points one by one that are learnt during that period on black board.

(9) Home work :

The concepts / points learnt in the period problems related to underheading of do this, try, problems from exercises, are to be given to students as exercise. The students must be instructed to do them on their own.

- The homework must be checked, corrected.

Instruction : Teacher should straine more to develop understanding of the concepts among students. If concepts are understood properly then students try to solve the problems. To achieve this more examples and real life examples are to be given. For understanding of concepts, to find examples, for good learning activities teacher should read reference books. It is important that teacher should allot time to read and prepare material. The quality of teaching and learning activity depends upon this preparation

"Mathematics means not only solving problems but having grip over the concepts and achieving higher educational standards."

Readiness of the Teacher - Plans

The teaching learning activiteis of the teacher which are presently under use must change to suit the text books that are prepared according to new syllabus. The change is more essential to achieve the educational standards so set. Every teacher should understand syllabus, educational standards that are to be achieved and accordingly he/she should keenly analyse the units and prepare teaching plans.

- Readiness is pivotal in class room learning and teaching activities.
- The basic of readiness is undertaking activities that make the students achieve participants in activities.
- The readiness of students also depends upon estimating the behavioural changes of students continuously and also evaluating the competencies of students through comprehensive evaluation.

Spare a thought :

- Is teaching learning of mathematics is natural or artificial ?
- Is teaching taking place according to nature of mathematics and apptitude and nature of children ?
- Is the teachers aware of changes that are taken place in teaching methods and teaching learning activities ?

- Are the students learning maths only way as taught in class room by teacher ?
- Are the students acquiring concepts through self experiences too ?
- What are the behavioural changs that are expected by learning mathematics ?
- Are the students applying maths in real life situations ? And utilising in different scenario ?
- Why there is shortfall in utilising the maths knowledge ?
- There is a talk that the standards in learning maths are gone donw, why ?
- Is it because of deficiency in arrangement of topics in text book ? Are deficiency in class room teaching ? Or lack of understanding among students.

Our State Educational Planning Act - 2011 after discussing at length about the issues mentioned above suggested many instructions and advises begining from educational planning to class room - teaching methods for changes. In this background the new text books are designed. The changes that come over the time in society has influence on the child needs accordingly the student participation in learning activities is must the teaching methods too are to be changed. Hence there is need to observe, study the methods of teaching that are presently under use and change these according to changes made in new text books. The methods which or more effective to imart learning are to be adopted.

Changes that are made in new text book

Let us first notice the changes that are brought in new text books.

- Keeping continuous comprehensive evoluation in mind in annual plans at every stage chapters on different fields (Arithmetic, Algebra, Mensuration, Statistics....) are included.
- In every chapter the topics is introduced by testing the previous knowledge through their experiences in real life similarly the concepts of chapter too introduced.
- The chapter is divided into subunits of small size and problems are provided in discussion method.
- In every point that is learnt to understand the comprehension immediately. Experiences are provided under heading of do this.
- To develop the anylitical ability and logical thinking and also to help understanding concepts, to state reasons, utilisation of mathematics termonology, to establish relationships and corelation within different domains problems are provided under heading "Try These".

- To develop thinking, to discuss the problems logically and to develop analytical ability, to develop wider understanding of concepts a segment think, discuss, write is introduced.
- By above process there is an opportunity for student to solve new problems.
- Like this after two or three concpets exercises with different problems are provided.
- To complete the teaching learning activity successfully teaching learning material is not only important but indispensable.
- The various segments that are accombidate in chapter (such as try this, think discuss, write etc....) hep to create coperation among students, and also for group discussions.
- The biographics of mathematics, puzzles, playing with mathematics etc develop intrest towards study of mathematics.
- We can identify clearly the differences between present teaching methods and teaching methods that are takenup based upon the new text books. That is the reason why every teacher must study each chpater exhaustively. In how many ways we can involve students in discussion, activities, formulalisation should be thought off. Teacher assuming the role of guide should enable the students to learn on their own. The teacher should create such environment and encourage students.

Readiness of teacher : Responsibilities

- How teacher should prepare before entering into class ? What notes he prepared ?
- What type of equipment he should prepare ?
- What teacher should do so that all students actively take part in learning activity ?
- What are the activities the teacher should take up after teaching in class ?

However good the text book is it can not be a substitute of a good teacher this fact is evident to you. With total and clear understanding of contents of text book, keeping the objectives inview and with full preparedness teacher should undertake the desired teaching. What are the areas in which the teacher should be ready we shall learn in this chapter.

Teacher readiness :

1. Teaching Lesson - Readiness :

- The desired compitencies of each lesson are to be understood.
- Should have understanding about lesson and exercises before entering into class.

- Depending upon exercises they are to be taken up as individual, group, totally class room exercises.
- Identifying the standard of children - they are to be divided into groups of A, B, C and understanding should be developed upon the activities.
- Should provide instructions regarding group work.

2. Teaching Material - Readiness :

- Teaching materials such as charts, sketch pens, graphs, squares rule papers, news papers etc... which are accessable to students and teachers are to be utilised.
- While teaching chapters like Statistics, Geometry... etc. The items that can be used in teaching these topics like colour pictures etc are to be collected from magazines.

Reading - Learning Material :

1. Charts
2. Geometry Box
3. Isometric Graph
4. Square paper
5. Graph paper
6. Dice
7. Coir
8. Trace paper
9. Colour papers
10. Scissors
11. Scale
12. Circular plate
13. Mirror
14. Uniformely thickness string
15. Maps
16. Geometrical solids

3. Proper utilisation of learning time of students :

- Teacher should ensure that children utilise the learning time fully.
- Teacher should see that all children are participating in learning activities.
- Teaching learning activities are to be conducted with keen interest and enthusiasm.
- Caution should be exercised so that children do not loose interest in learning by montonous activities.

4. Teacher responsibilities :

- Every day at prescribed time teacher should take the class and only an completion of days learning activities he / she should to come out of the class.
- Should make sure that all children are participating.
- Should have planned seperate learning activities for the gifted children.
- The intelligence and talents of the gifted children are to be utilised fully.

- There is no doubt about the success of the teacher in achieving set goals if the teacher had peiod plans, unit plans, year plans that is the reason why every teacher should prepare annual lesson, period plans.
- In the teaching plan provision should be made to accombidate the self responses of students according to their learning stages.
- The contents of the children note books are to be discussed and they should be prepared to correct on their own.
- The question paper is to be prepared before lesson evaluation.
- The worksheets that are to be used for evaluation are to be self prepared by teacher.
- The learning levels of the student is to be assessed and accordingly the optritinuity of learning must be provided for backward students.
- The progress of the student must be reported to parents and discussed.

Model Plans

So far we discussed about the readiness of the teachers to achieve the above mentioned objectives what plans teacher should prepare ? We understand this by observing a model plan.

Annaul Plan

1. Class : 8th Class
2. Subject : Mathematics
3. Required period : (a) Total Periods : 290
   (b) The periods required for teaching learning activities : 212

The Academic Standards that are to be achieved by students at the end of the year :

(1) Problem solving : Solving problems from chapters. Number system, Algebra, Geometry, Mensuration, Arithmetic in methodical way.

Solving problems from number system Algebra, Geometry, mensuration, data management, arithmetic not only in one way but in different methods.

(2) Stating Reasons - proving results : Generalisation of specified concepts and understanding of projects from the chapters Algebra, Geometry, mensuration, data management, arithmetic. The student not only understands concepts and projects but executes them.

While solving problems in above in mentioned students gives reasons and understands the method.

Using deducting and inducting reasoning in problem solving, proving results, constructions.

Understanding order in problem theorems.

Testing logical discussions, projects pertaining to different concepts. For this purpose activities are to be conducted and teacheer should ensure that all children participate in such activities. For better understanding more real life examples are to be associated with activities.

(3) Problem Solvings : After developing the concepts in students problems related to those concepts are to taught. Teacher presents the logical steps in problem solving by interactive session - and illustrations and discussion with students while writing the steps on black board.

7. Model Problems solving :

- Teacher should make students to solve a problem which is similar to that solved by him. He should do this by writing the problem on black board and asking the students to individually and independently solve.
- Once the students solve the problem - the students must be made into groups of three/ four students and allowed to discuss the solution of the problem and its correctness.
- Teacher should observe the method in which students are discussing the solution of the problem.
- If small errors have occured in problem solving the teacher should create a situation in which student themselves correct those errors or students should be made to discuss the solution to rectify the error.
- If the students have committed large number of errors then the teacher should discuss the solution with all students of class by solving it on the black board.

8. Recaptulation :

The concepts / points learnt by the student on that day during the period are to be recaptulated. That is to say that all the points that are learnt are to discussed by one by various methods such as mind mapping. These points are to be written on black board. Instead teacher may discuss each point by writing on the black board.

9. Home work :

The problems pertaining to the concepts learnt in the class (do these problems, try these, problems in exercise) are to be given to students as exercise. The students are to be instructed to do them on their own without any help.

3. Expressing :

- The ability to read and write sentences related to theorems, symbols, pertaining to concepts, problems of the chapters number system, algebra, geometry, mensuration, data management, arithmetic.
- Expressing his thoughts related to chapters above mentioned in his own words and formulation of new problems in these chapters.
- Explaining the logic involved in problem solving in the above mentioned chapters.

Connecting :

- He will be able to connect the concept learned in number system, algebra, geometry, Mensuration, data management, Arithmetic to read daily life situations and solve the problems.
- Connecting the concepts in different areas within the mathematics such as algebric concepts in Geometry. The concepts such as arithmetic in algebra, geometry, arrangements, and symmetry understanding in geometry. Similarly utilising the concepts learned in maths in other areas.
- Utilising multiple concepts, multiple methods in a single problem. Similarly applying mathematics concepts to understand other subjects

Representation - Visualisation

- To displaying information in the form of Histograms, frequency curves, conversely to read graphs and draw out information.
- To read 2D, 3D geometrical figures consisting of different planes, also able to draw these figures.
- Able to represent different types of numbers on numberline.
- Construct simple gremetrical pictures such as quadrilaterals and display them.

Monthwise Unit Division

Month	Unit Name	Periods needs	Teaching aids	Activities that are to be conducted
June	Rational numbers	28		Observing nos, and formulaisation
July	Equations in are variable	7	-	Forming Maths Clubs
July	Construction of quadrilateral	20	Geometry box	Identifying Geometrical figures in construction
July-August	Powers and exponents	7		Quiz
Sept	Square roots, cube roots	23	Cubes	Maths Seminar
Sept-Oct	Frequency distribution Graphs	20	Graph paper display boards information tables	Preparation of graphs and information tables
Oct	Exploring Geometrical Figures	20	Symmetric figures symmetric shapes	Doing similar expansions, preparation of tessalations
Nov	Areas of plane figures	10	Plane figures tapes	Filed trip. Maths Exhibition
Nov-Dec	Direct Poportionality Inverse proportionality	13	Geographical charts	Conducting a project
Dec	Algebric Expressions	6		National Maths day
Jan	Factorisation	6		School level Olympiod
Feb	Representing three dimensional figures as two dimensional figures	13	Various Geometrical figures with same dimensions	Drawing 3-D figures as plain paper. Forming solide by
Feb-March	Surface areas volumes	10	3-D Geometrical Figures cube Cubiod	Exhibition of Maths Projects
March	Let us play with numbers	10	Books on theory of numbers puzzle books	

(6) The responses of teacher on implementation of year plan

.....

(7) The responses of Head Master on implementation of the year plan

.....

Lesson Plan

1. Class : 8th
2. Lesson Name : (6) Square roots, cube roots
3. Required period : Teaching periods + Exercises
   9 + 5 = (14)
4. The competencies that are to be achieved by the end of the teaching lesson.

(1) **Problem solving :**

- Students acquire the ability to solve problems related to square root - cube root (Factorisation method, division method)

(2) **Giving Reasons - Stating Proofs :**

- Students can tell whether the given numbers are perfect square or perfect cubes with proper reasoning
- They can test three numbers for phythogaros triods with the help of phthogaros theorem. They can also give correct reason for identifying.
- They establish relationship between cubes and cube roots, by giving the correct reasons.
- They estimate cuberoots of given number and state reasons.

Communications

(3) ● Students cupress square root and cube root of given numbers in mathematical symbols.

Ex : Square of 2 is 4 $\rightarrow 2^2 = 4$.

Square root of 9 is 3 $\rightarrow \sqrt{9} = 3$.

(4) **Connections**

- In the process of finding square root and cube root the students connect various concepts such is multiplications, division, subtraction involved in finding squre root

- Students connect squre - squre root - cube root concepts in finding areas and volumes of geometrical figures.
- In real life situations above concepts are utilised by students.

(5) **Representation - Drawing :**

- Students represent the square numbers of squares. Perfect cubes by cubic.
- Similarly they can represent square roots of perfect squares by squares.
- The cuberoots of perfect cubes by cube.

5. Teaching learning material : The charts with illustrations of squares. Charts with cubes drawn - perfect square numbers - charts showing the perfect cubes.

Periodwise Division of Lessons

The Period No	Teaching Points	Teaching Stratagies	Sources	Evolution
1.	Square numbers - understanding about perfect square numbers	Previous learnt concepts are revised through brain mapping. Reading - conducting activity through discussion	Square shaped figures, Charts	● What is square root of 24 ? ● Is 56 perfect square if so why ?
2.	Square numbers - arrangement understanding	Brain stroming activity concept understanding developed through activities	Square shaped figures, Charts	● Write 152 as sum squares of two consecutive numbers
3.	Exercise 6.1	Organising discussions for the purpose of enabling students to develop understanding and solve problems from exercise on their own.		
4.	Square root - Phythogoros triods	Conducting discussion for total class through examples - making students to solve	Charts containing phythogoros triods	● What is square root of 196? ● Are 36, 48, 50 are phythogoros triods?

The Period No	Teaching Points	Teaching Stratagies	Sources	Evolution
5.	Finding squre root of given number - understanding.	Observing the previously learnt concepts by mind mapping. Developing understanding about terms by making students read.		● Find the square root of 625 by factorisation method.
6.	Exercise 6.2	Developing understanding through discussion		
7.	Finding square root of perfect square by division method. Estimating the square root of not a perfect square numbers.	● Observing the pre-requisite concepts through mind mapping. ● Developing concept understanding by activities. ● Develop problem understanding by solving a model problem		Find square root of ● 784 by division method ● Approximately find square root of 165.
8.	Exercise 6.3	Discussing each problem of the exercise and develop understanding so that student solves the problems on his own.		
9.	Cubic numbers ● Introduction ● understanding	Observing the previous ● by mind mapping ● To develop understanding conducting activities ● Organising the discussion to develop understanding on problem. ● Making student to solve individually		What is Cube root of 25 ?
10.	Cubic numbers arrangement understanding	-do-	Square shape figures charts	Is 500 perfect cube? If so why? Yes or no?

The Period No	Teaching Points	Teaching Stratagies	Sources	Evolution
11.	Exercise 6.2	Make the students to read the problems from exercise - organising discussion - develop - understanding on problem solving.		
12.	Finding Cube roots understanding	● Conducting Brain storming session. ● Develop understanding through discussion. ● Developing problem solving understanding through example.		Find the cube root of 5832
13.	Estaimating cube roots understanding	-do-		Estimate cube root of ● 2744 and state reason for such estimation
14.	Exercise 6.5	Develop the understanding on problem solving by making students to read the problems.		

- The additional information collected by teacher .....

  .....

- Responses .....

Instruction : The teaching stratagies are to be implemented as per steps suggested in period plan. For this mind mapping, brain stroming activities are used to know the understanding. If the understaind is not taken place it should be developed by making the student to read, help discussions, organise activities. The understanding towards the problems is to be developed through examples. The teaching stratagies should invariably include making the student to solve the problems independently. To enable the student to solve the problem independently discussion should be held on each problem and complete understanding to be developed. Teacher should shrine to achieve set educational standards.

Period Plan

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots, Cube roots **Period No.** : 1

III. **Teaching Point :** Square roots - Introduction - Understanding. **Duration** : 45 Minutes

IV. **The Academic Standards to be achieved by students.**

Problem solving : Students can find square root of given number.

Stating reasons
Giving "Proof" :

- Can state the number is a perfect square or not with correct reasoning.
- Staes squre root of even number is even, square root of odd numbers is odd. Can state the reasons for these results.

Communications : They express squares of the numbers in symbolic form.

Ex : Square of 4 is 16

$4^2 = 16 = 4 \times 4$

- Can state the sentence in normal form which originally is in mathematical language.
- Students can give examples to square numbers.

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I) Introduction i) Greetings ii) Mind Mappings iii) Topic Announcement iv) Relavance of topic	Good morning students. To test the previuos knowledge and draw out thinking ability following questins are put. ● How much is 2 × 2, 3 × 3, 4 × 4 ? ● Upto how many numbers you can say like above numbers ? ● What is relationship between the products mentioned above ? ● What you call the product of two identifical numbers? ● Inform the students about product of same numbers. ● What type of factors are should write to find number to perfect square ? Today we learn about square numbers. In real life situations while finding areas of field, different shapes concept of square root is used. It is also used in Arithmetic, Algebra.	2 × 2 = 4 3 × 3 = 9 4 × 4 = 16	● Text book. Chart containing 1 to 100 numbers. Chart containing squares of numbers 1 to 30.
II. Presentation a) Conceptual understanding Reading	The students are made to read pages 122 to 123 of the text book. After making students to note the key terms. They are written on Black board and illustrated with examples for the whole class. Ex : Whole numbers, rational numbers perfect squares, square number.		

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
b) Activity	I will make students understand about square numbers, their properties through following questions. In addition a chart of 1-100 numbers and squares of 1-30. Pasted besides black board as ready reference. ● Observe table 1 of chart. ● Which among these are perfect squares ● Round the numbers which are perfect squares by marking ◯ sign ● How many perfect squares are there between 1-100? ● Is 56 a perfect square ? Why ? Why not ? What are the integers between 16 and 25 ● Observe table-2 ● Fill up the blanks of table-2 in chart ● 2, 12, 22 square numbers you observe ● What digit is appearing in units place of squares of 2, 12, 22 ● Observe squares of 1, 11, 21 and 9, 19, 29 ● What number is coming in units place of the squares of these numbers ? ● Similarly observe squares of other numbers ● State what points you observed ● If a number has 0, 2, 3, 5, 7 and 8 in its unit place the squares of those numbers have 0, 4, 9 and 9, 4.		**Table-1** Chart containing 1 to 100 numbers **Chart-2** **Table-2** Containing squares of numbers from 1 to 30

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
III. Problem Solving	State which of the following are perfect squares. Giving reasons. (1) 9 (2) 108 (3) 168 (4) 240 (5) 529 Writing the above problem on black board dicussing with children. I develop the understanding towards the problem solving. ● What are given numbers ? ● What digits are present in the units place of given digit? ● What is square of 3 ? ● What is square of 13 ? ● What is square of 23 ? ● What is the relationship betwee 3, 13, 23 squares ? ● Is 108 a perfect square ? ● What digits may be there in those numbers which are not perfect squares ? ● Among given numbers which are perfect squares ? What is the reason ?	Which among the following are perfect squares. Give reasons. (1) 9 (2) 108 (3) 168 (4) 240 (5) 529	

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
IV. Model Problem Solving	I will write the problems on 124, 125 on Black board and ask the students to solve individually. After solving I will allow the problem solution to be discussed. In groups if errors are more in number problem solution. I will write on Black board and I will explain.	Between (1) 100-150. How Perfect square are there? (2) Which among following is perfect square? (1) 84 (2) 271 (3) 225 (3) Which digit will appear in its place of 24, 34	
V. Recaptulation	We have learnt about square numbers today. The recaptulation is done through mind mapping.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 2

III. **Teaching Point :** Arrangement of perfect squares. **Duration** : 45 Minutes

IV. **The Academic Standards to be achieved by students.**

(i) **Problem solving** : They can find square root of given number.

(ii) **Stating reasons - Giving proofs** :

- They understand arrangement of perfect squares. They give reasons for realations in the arrangement.
- They can generate the perfect squares arrangement and can give reasons.
- How many integers lie between two consecutive integers ? They answer this question with reason.
- They can continue the arrangement of square numbers.

(iii) **Communications** :

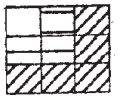
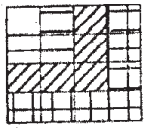
- After understanding the arrangement of square numbers they can express the sum n^2 generalise form.
  Ex : Sum of odd number is n^2

(iv) **Connecting** :

- They can connect concept of square numbers in different mathematical problem solving.
- They can connect concepts in the real life situations which they came accross.

(v) **Representation Drawing** : They can represent the arrangement of square numbers in squares.

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
i) Greetings	Good morning students.		● The Chart showing arrangement of square numbers.
ii) Testing previous concepts Brain stroming	The concepts learnt in previous class are to be strengthened through following questions ● What is meaning of square of a number ? ● Is every square number is perfect squares ? ● The square of an even number is even. How can you say ? ● The squares of odd numbers is odd. What is the reason ? ● With square numbers any arrangements can be made.		
iii) Topic	Today we will learn interesting arrangements among square numbers.		
iv) Relevance of the topic	In real life situation, places (different shapes), their areas finding. We use square concept in tyling.		
II. Presentation Conceptual understanding	I will make students to observe arrangements in text text books page no 126 to 127. I will make them to identify the relationship. In the topic mentioned below.		

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
a) Reading	I will make them to identify key words and writing them on black board and discuss it with examples to total class and develop understanding. Ex : Polyndrom	 $1=1^2$ 	
b) Activity	I will divide students into groups and draw table of squares in page 126 on black board and take up the activity to make them understand. ● Observe first square. ● Observe second square. ● What is the sum of two odd numbers ? ● To what sum of squares of first two odd numbers is equal to ? ● What is the sum of first three numbers ? ● What is sum of squares of first three numbers equal to? ● Similarly what is the sum of square first four numbers equal to ? ● What is the sum of first five odd numbers ? ● How can above sum can be written as square ? ● Like this how can write 'n' odd numbers sum ?	$1+3=4=2^2$  $1+3+5=9=3^2$  $1-1 = 1^2$ $1+3 = 4 = 2^2$ $1+3+5 = 9 = 3^2$ $1+3+5+7 = 16 = 4^2$ $1+3+5+7+9 = 25 = 5^2$ $1+3+5+7+9+11-- = ()^2$ $1+3+5+7+9+11+13-- = ()^2$ n consequtive odd numbers sum ..... $= (n)^2$	

Teaching Learning Activity	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
III. Problem solving	Write the arrangement given in page 126 (2nd arrangement) on black board. While discussing with students the solution of problem should be made to understand ● What is square of 11 ? ● What is square of 101 ? ● What is square root of 1001 ? ● Observe the squares of the above three. ● Is there any relation between the three square ? ● In a similar way what is square of 10001 ? ● Similarly fill up all the blanks. ● What does you inter from this ? ● Can you fill up the other blanks ? If so fill them up? These numbers are called polyndrum numbers. Now I will illustrate more about them.	$(11)^2=121$ $(101)^2=10201$ $(1001)^2=1002001$ $(10001)^2=100020001$ $(100001)^2$=..... $(1000001)^2$=..... ( )^2=.....	
IV. Model problem	The third arrangement in page 126 of text book is written on black board. I will ask the students solve the problem in their note books. After they solve the problem they are divided into groups and discuss the solution. If small errors are committed I will encourage them to correct them on the other hand if the errors are big. Another model problem is selected and solved with detail discussion with class by writing steps on black board.	$1^2=1$ $11^2=121$ $111^2=12321$ $1111^2=1234321$ $1111^2=123454321$ $11111^2=12345654321$ ( )^2=.....	
V. Recaptulation	Today we learnt about square numbers, polyndrum, arrangement of square numbers		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 3

III. **Teaching Point :** Exercise 6.1 **Duration** : 45 Minutes

IV. **Academic Standards that are to be achieved by students.**

(i) Problem solving :
- They find square root of given number.
- They find how many squares are between two integers.

(ii) Stating reasons - Giving proofs :
- They state whether the given numbers are squares are not ? by giving reasons.
- Are the given numbers are even square numbers ? Odd numbers ? they observe and tell with reasons.
- They can generalise sum of squares of first n odd numbers is n^2. They can check the order of given numbers.
- They can continue the arrangement of square numbers.

(iii) Expression :
- They can express square numbers in mathematical language.

(iv) Connecting : -

(v) Representation Drawing : -

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
i) Greetings	Good morning children.		
ii) Testing previous concepts Brain stroming	The previous knowledge pertainint to the present lesson is tested through following questions. ● What is product of 8 × 8 ● What is the square of 8 ? ● Is 81 a perfect square or not ? Why ? ● Is 58 a perfect square or not ? Why ? ● Is square of an evne number's even ? Odd number square is odd ? Why ? Give example. ● How can you say a number is perfect square ?	$8 \times 8 = 64$ $8^2 = 64$	● Text Book Black Board
iii) Announcement of Topic	Today we learn about how to solve problems given in Exercise 6.1 of the text book.		
iv) Relevance of the topic	Students today based upon your learning in previous classes you are going to solve the problems of 6.1 individually. Thus who to solve these we will discuss today. By this we will also able to solve the problems we came across in real life situations. This way I will convey the relevance of topic.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
II. Presentation Total class room activity	Solving problems given in page 128 Exercise 6.1 in preferential order. This is done by discussion with children in the following way. 1. How to solve problem 1 - (iv)given in Exercise 6.1 is illustrated as following discussion ● Read the given problem. ● What is to be found ? ● What is in units place of 7286 ● Is this number even or odd ? ● What is square of 6 ? ● Which digit is present in units place of square of 6 ? ● Now what digit can appear in units place in square of 7286 ? ● Verify whether your answer is correct or not ? 2. The solution method of problem 2 of exercise 6.1 is illustrated by discussion with the students through the following questions. ● What numbers are given in question ? ● Think about what is to be found ? ● How that can be found ? ● Prepare a table of squares of numbers 10 to 25. ● Observe square numbers table does all square numbers are perfect squares ? Why ?	In 7286 square number which digits appear in units place.	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● Using table can you say the numbers given in the problems are perfect squares ? Give reasons. ● How the problem (3) solved in exercise 6.1 is illustrated to whole class through discussion through the following questions ● What are numbers given in the problem ● What is to be found ? ● How can it be found Think ? ● Prepare a table of squares of numbers 10 to 25 ● Observe the square numbers given in the table. ● In square numbers what digits are appearing in units place ? ● Now what digits are appearing in units place of numbers given in problem (3) ● Now tell whether numbers given in problem (3) are perfect square or not. given reasons. Now I will illustrate method of solving problem (4) of exercise 6.1 by discussion through following questions (total class room activity) ● In problem what numbers are given ? ● What is to be found ● How you will find ? Think ● In problem one number is 17779 observe		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● Is this a even number ? Odd number ? Why ? ● Is 2826 square even number ? Odd number ? Give reasons. In exercise 6.1 problem 5(i) how is solved is illustrated through discussion by putting the following questions ● What is to be found 5(i) ● In between 25, 26 how many integers exists ? gauss ? ● How one can find ? ● What is squares of 2, 3 ? ● In between squares of 2, 3 how many integers are here ? Write ? ● What is the square of 3, 4 ? ● In between squares of 3, 4 how many integers exists ? ● In square of 2, 3 and 3, 4 how many integers are existing ? Observe ? ● Now how many integers exists between n, n+1 ? ● Can number of integers be found that are between 25, 26 by generalisation. ● Find how many integers exists between 25 and 26		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	6. In exercise 6.1 sum 6 is taken up. How this is to be solved by discussion through following questions ● How much is 1 + 3 ? ● How much is sum 1 + 3 + 5 ? ● How much is sum 1 + 3 + 5 + 7 ? ● Observe in the above pattern numbers and their sum ? ● What do you observe ? ● What is the sum of two consecutive odd numbers sum ? ● 4 is square of which number ? ● What is the sum of first three odd numbers ? ● 9 is square of which number ? ● What is sum of first four odd numbers ? ● 16 is square of which number ? ● Now tell me how much is first five odd numbers ? ● 25 square of which number ? ● What is the sum of first 9 odd numbers becomes square of which number ?		
III. Recaptulation	Today we solved the problems of Exercise 6.1 with the help of concepts of square numbers.		
IV. Home work	I would ask the students to solve problems of 6.1 individually in their note books.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 4

III. **Teaching Point :** Square roots phytogoros triods - understanding. **Duration** : 45 Minutes

IV. Academic Standards that students should achieve.

(i) Problem solving :
- Can find squares of given number.
- Can find square roots of given number.

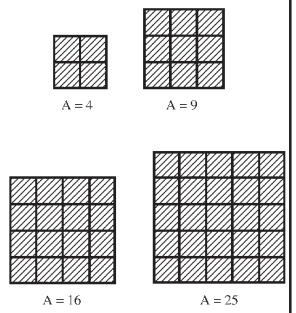
(ii) Stating reasons
- Providing results:
- They can tell whether the given numbers are perfect squares or not ? With giving correct reasons.
- They can tell whether the given numbers are phthogoras triods or not ? By giving appropriate reasons ?
- They develop understanding relationship between square and square root.

(iii) Communications :
- They can express squares - square roots of the numbers in mathematical language.
  Ex : $\sqrt{144} = 12$; $12^2 = 144$.
  Square root of 144 is 12
  Square of 12 is 144.
- They can gie examples for phthogoras triods.

(iv) Connecting :
- The concepts of square square roots are used in different areas of maths such as Arithmetic, Algebra, Geometry. Student establish this connection.
- They can connect concepts in different real life situations.
- They can connect the concepts that are used in different subjects.

(v) Representation
Drawing : -

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
i) Greetings	Good morning children.		
ii) Observation of previous concept	The concepts learnt in previous classes are to be restrengthened by putting the following questions. ● The sum of the first three odd numbers sum is equal to square of which number ? ● What is the formula for sum of squares n odd numbers ● What is meant by polyindrim ? ● What is the square of 13 ? ● Write 25 as product of two equal factors ● What can be are of the two equal factors be called?		● Text Book The chart containing 1-100 square roots. The chart showing
iii) Announcement of Topic	Today we will learnt about the square root of numbers.		
iv) Relevance of the topic	When different geometrical shapes areas fields areas, are given and we required find perimeters we use square roots		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
II. Presentation (a) Conceptual Understanding Reading (b) Activity	I would ask pupils to read page no 129 Exercise 6.3. From this students are made to identify key terms, relations, symbols. The same were written on black board. These are made to understand to total class by illustrations. Ex : Pythogarian triods, primary triads. By drawing squares given in page 129 on black board and through discussion with students by putting following questions. I would conduct activity to make student understand square roots of numbers. ● What is the area of first square ? ● What is area of second square ? ● What is area of third square ? ● If fourth square are is 25 sq units what is the side ? ● 169 is written as product of two same factors What is that factor ? ● When a perfect square is written as product of same two factors what is that same factor called ? ● What is square root of a number ? ● What is square root of 7 ? ● How square root is shown ? Like this discussion with children would be held.	 Square root of 49 is 7 $\sqrt{49} = 7$	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
III. Problem Sovling	The problem of find square root of 144, 225 on the black board. The same is solved by discussing with students through the following questions. With this solution is understood by the student. ● Is 144 a square of a number ? What is the reason? ● What is the same number twice written as product can be equal to 144 ? ● What is one of the two identical factors of 144 is called ? ● What is symbol for square root ? ● What is value of $\sqrt{144}$. ● How 225 can be written as product of two same numbers ? ● What is value of ?		
IV. Model Problem Solving	A model problem is given to students and they are asked to solve individually. The solutio is made to discuss in the group. If the errors are more in number the solution is written on the black board and through discussion the solution is made clear.		
V. Recaptulation	Today we learnt about square roots, pythogorian triods. This is recatulated by mind mapping.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 5

III. **Teaching Point :** Finding square root of given nuber - understanding (Factorisation method) **Duration** : 45 Minutes

IV. **Academic Standards that are to be achieved by students.**

(i) **Problem solving** :
- by factorisation method students find square root.
- They find square root by subtracting consecutive odd numbers.

(ii) **Reasoning and Prooving** : They can find square root of the given number and can give reasons.

(iii) **Communications** : They can express squares and square rotos in mathematical language. Similarly the information in mathematics can be translated into ordinary sentences.

(iv) **Connecting** : Square - square roots concepts are applied in different chapters of mathematics. The students can make connection. In real life situations they can connect concepts.

Above concepts can connect within the different subjects.

(v) **Representation Drawing** : -

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings	Good morning students.		
● Testing the previous concept Brain stroming	The concepts learnt in previous periods are observed and strengthened by following discussions. ● What is square of 4 ? ● What is the meaning of perfect square ? ● What is the meaning of square root ? ● What is square root of 25 ? ● What is squareroot of 64 ?		
b) Topic Announcement	Today we learn how to find squre root by factorisation.		
c) Relevance of the topic	In real life situations we may have to find the square root Ex : Finding area Finding radius		
II. Presentation Conceptual understanding reading	The students are made to rad pages 131, 132. The students are guided to make note of key terms, relations symbols. The same are written on black board and develop understanding among students through following discussions. **Ex :** Finding square root by difference of odd numbers, finding square root by prime factorisation		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
(a) Activity	The understanding is developed by discussion by posing the following questions : ● What is the given number ● What is to be found ? ● Do you know how to find square root by different methods ? ● To obtain square root by subtracting consecutive odd numbers whatone should do ? ● How far subtractin must be carried ? ● What can you understand by this ? Why ?		
Activity - 2	The method of finding square root by prime factorisation is illustrated by following discussion. ● What is given number ? ● What we should find ? ● To find square root by prime factorisation what are should do ? ● What are should do after writing prime factors ? ● How many pairs of equal factors you got ? ● Now what would be the square roto of 484.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
III. Problem Solving	The problem of find square root of 136 by method of subtracting consecutive odd numbers from the number is written on black board and by logical steps and through discussion the solution is made clear to students. ● What is given number ● In what methods square root is found ? ● In first step what did we do ? ● If we do like this in which step we got 'o' after subtracting odd number ? ● How many consecutive odd numbers are subtracted before obtaining 'o'. ● What is square root of 36 ? ● What you got when 36 is written as prime factors product ? ● How many equal factors fair has come ? ● How many equal factor to be taken from every pair? ● What is product ? ● What is $\sqrt{36}$ ● By what method finding square root is easy ?	1. Find the square root of 25 by difference of consecutive odd numbers 2. Find the square root of 2025 by prime factorisation	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
IV. Model Problem Solving	Students are asked to solve similar problems individually. The solution is made to discuss in the groups that are divided by teacher if problems are solved by lesser errors they are guided to correct them. If larger number of errors have occured similar problem is solved to make them understand problem solution.	1. Find square root of 25 by difference of two consecutive odd numbers. 2. Find the square root of 2025 by prime factorisation	
V. Recaptulation	I would tell the students today we learnt how to find the square root by difference of two consecutive odd numbers.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 6

III. **Teaching Point :** Exercise - 2 **Duration** : 45 Minutes

IV. **Academic Standards that are to be achieved by students.**

(i) **Problem solving** :
- The students can find square roots of given number by prime factorisation.
- By what learn positive integer is need to be multiplied to given number to make it perfect square.

(ii) **Reasoning and Prooving** : They can identify and state whether the given numbers are perfect square or not. They can give reasons.

(iii) **Communications** : They express the square roots in mathematical language

Ex : $\sqrt{25}$ = 5 square root of 5

(iv) **Connecting** : Square - square roots concepts utilisation in Arithmetic - Geometry - Algebra is identified by students. The connect concept in other area.

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings	Good morning students.		
b) Observation of previous concept	The previously learnt concepts pertaining to present topic are observed by putting the following questions. ● What is square root of 25 ? ● What is square root of 100 ? ● Is 125 square root of any number ? ● Find square root of any number ? ● Find square root of 81 by factorisation method ? ● Find the least number that is to be multiplied to 243 to make it perfect square ? ● By what least number 1024 is to be multiplied to make it perfect square ?	$\sqrt{25}$ = ? = ? = ?	
c) Announcement of topic	Today we will learn method of solving problems from Exercise 6.2 of text book.		
d) Relevance of the topic	Today we will learn the method of solving problems from Exercise 6.2		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
II. Presentation Problem solving (Total class activity)	How to solve the problems of page 133, 134 given in Exercise 6.2 is illustrated to students by discussion through following questions. 1. How to solve problem (1) (iii) from exercise 6.2 by students is explained through following questions. ● Read Problem 1. ● What is to be found ? ● Observe (i) problem of (iii) ● How to find square root of 4096 ? ● Reduce 4096 into prime factorise ? ● By doing what next are can find square root ? ● After prime factorisation the repeated primes are to be arranged as pairs ? What do you observed ? ● In every pair how many identical factors are there ? What is the square root of each group ? ● Take an factor in each group ? ● Now is it easy to find square root of 4096. Find how much it is ? In this way find square root of each number given in problem by factorisation.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	2. Problem (2) of exercise 2 is taken up the mode of solution is taught by the following discussion. ● Read the problem. ● What is to be found ? ● How it can be found ? ● Can you divide 3645 as prime numbers product, divide. ● What to do next ? ● Write prime facotrs as pairs of identical factors ? ● By what least number 3645 is to be multiplied so that it becames a perfect square. Similarly try to solve problem 3, 4 on your own. 3. The problem No. 5 of Exercise 6.2 is to be solved by the students. The method is illustrated by following questions. ● Read the problem. ● What is to be found in problem ? ● What is the information given in problem ? ● How many trees are there in garden ? ● How the trees of the garden are arranged in ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● How many rows ? In how many columns ? The trees are arranged does this information exist in the problem ? ● Is there a relation between the total trees and product of trees in rows and columns ? ● If so how can number of rows in garden are found? What concept do you utilise ? ● How square root of 1521 is found ? ● What does 1521 square root indicate ? ● The problem is to be solved following way. Similarly problem No (6) and problem (8) are assigned to students for solving. 4. In Exercise 6.2 Problem 7 is taken up and how to solve these problems illustrated by following discussion (total class activity) ● Read problem ● What is the information in problem ? ● What is to be found ? ● How to find ? ● If first number is assumed as x what is the second number ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● What is the product of these number ? To what that is equal ? ● Now it is in what form ? ● Solve algebric equation and find x ? ● Next can you find the two numbers ? ● Solve problem like this. 5. The problem No 9 of Exercise 6.2 is taken up and students are taught how to solve this problem by discussion as follow. ● Read the problem. ● What is asked to be found in problem ? ● What is information given in problem ? ● From area of square field how you would find side ? ● If side is known that of a square how you will find side ? ● If the width is assumed as x, what is the length ? ● Now what is the perimeter of rectangle to what is it equal ? ● By equating perimeters of rectangle and square forming algebric equation can you find length and breadth ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● If length and breadth of rectangle are known can you find area ? How do you find ? ● Solve the problem like this.		
Recaptulation	Today we solved the problems given in Exercise 6.2. The main points are revised once more.		
Home work	The problems of Exercise 6.2 are assigned as Home work. The students are asked to solve them in their note books.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 7

III. **Teaching Point :** Finding square root of given number. **Duration** : 45 Minutes

IV. **The Academic Standards students are to achieve.**

(i) **Problem solving** : They can find square root of the given number by division method.

(ii) **Reasoning and Prooving** : They can identify whether the given numbers are perfect squares or not ? and give reasons for this.

(iii) **Communication** : They can find squre root and give reason.

(iv) **Connections** : The can use the concepts of square and square roots to solve the problems in Geometry Arithmetic

(v) **Representation Visualization** : —

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings	Good morning students.		Tex book, black board Chart contains squares of 1+0 = 30
b) Observing Previous Concepts	The concepts learnt in previous periods are strengthened through following questions. ● What is the square of 8 ? ● What is the square root of 25 ? ● What methods are available to find square root ? ● Which method of finding square root is easy ? ● Are there any other methods available ?		
c) Announcement of topic	Today we will learn how to find square root by division method.		
d) Relevance of the topic	In real life situations we come ccross situations in which we ae needed to find square root. Ex : Finding side finding square root.		
II. Presentation Conceptual understanding a) Reading	I would make the students to read the information given in text book page no 134 under heading of Finding Square root by division method. The key terms and definitions, relations symbols are identified by student with teacher guidence the same are written on the black board and illustrated to total class.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
b) Activity	Write problem from page 134 on black board. Step by step the solution is made clear to student as follows : ● What is given number ? ● What we should find ? ● In what way the square root to be found ? ● What are the steps involved in finding square root of number by method of division.	Find the square root of 784 by division.	
III. Problem Solving	The problem solving method is made clear to the student by following discussion. Problem from page 134 is written on black board. ● What is given number ? ● What is to found ? ● What did we do in the first step ? ● In second step which perfect square is choosen ? ● In step 3 what is obtained by subtraction ? ● If the quiotent obtained in step 4 is doubled what do we get ? ● In the blank box after 4 what would came ? gauss. ● In step 6 what answer is obtained after subtraction. ● By this what can be square root of 784 ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
IV. Model Problem Solving	The problem of page 136 is written on the black board. Students are asked to make note of the problem in their note books and solve individually. After solving problem the students are divided in groups and asked to discuss the solution. If small errors have occured the students are encouraged and guided to rectify them. On the other hand if more errors are committed by students a similar problems is taken up and solved with illustrations to total class to develop understanding.		
Recaptulation	Today we have learnt how to solve the problem of finding square roots of given number by division method. This way the recaptulation is done.		

Period Plan (Timeline plan)

I. Class : 8 **Topic :** Mathematics

II. Chapter 6 : Square roots - Cube roots **Period No. :** 8

III. Teaching Point : Exercise 6.3 **Duration :** 45 Minutes

IV. The Academic Standards the students are to achieve

(i) Problem solving :
- Students can find square root by division method. They can find the square root of decimals.
- They can express the given square root in the mathematical language.

(ii) Connections : Students can connect the concept of Arithmetic, Algebra, Geometry problems.

(v) Representation Visualization : —

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction a) Greetings b) Observing Previous Concepts	Good morning students. The previous concepts pertaining to current lesson are possessed by children. They are observed by putting the following questions. ● For a mathematical fate 256 children attended, observed and learnt about teaching aids. In the concluding ceremony. They are made to sit in rows such that the numbers of raws are same as number		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	of children can you now say how many rows children were sitting ? Can you say ? ● What is the answer ? ● Is your answer is correct ? ● Is there any other method ? ● Are there any other methods available ?		
c) Announcement of topic	Today we will learn the problem solve methods of problems given in exercise 6.3.		
d) Relevance of the topic	Children in earlier period you learnt concepts of square root using which we will solve problems from 6.3 individually. Therefore how to solve these problems I will discuss.		
II. Presentation Total class activity a) Reading	In text book page 138 exercise 6.3 problem solving is discussed with children in the following ways. (1) Problem 1(i) of the exercise 6.3 is explained to students how to solve that problem is illustrated through discussion as follow. ● Read the problem. ● In problem 1 (i) what is to be found for 1089 ? ● How the square root of 1089 can be found ? ● Give square root of 1089.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	Like above problem solving method is discussed similarly I would ask the students to find solution of problem (2) which consists of the decimals. 2. How to solve the problem 3 of exercise 6.3 is discussed with children as follows. ● Read the problem. ● What is the information given in the problem ? ● What is to be found ? ● How to find ? ● By division method if square root of 4000. What is the reminder ? observe. ● Can a learnt positive number is subtracted to make 4000 a perfect square ? ● This way try to solve problem 7 of exercise 6.3. 3. Problem 4 of exercise 6.3 is made to solved by children by following discussion. ● Read the problem. ● What is given ? ● What is to be found ? ● If area of square is given how the side is found ? ● How square root of 4489 is found ? ● The square root of 4489 is side of square.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	How to solve problem 5 of exercise 6.3 is discussed through following way. ● Read the problem. ● What is given in the problem ? ● What is to be found ? ● Gardener planted 8289 plants in what form ? ● How many of 8289 plants he can plant in square shape ? How you can find ? ● How many plants are left over after plantation ? ● Now can you say how many plants are planted in each row ? This way above problem solution is discussed. 5. How to solve the problem 8 of exercise 6.3 is discussed. ● Let us discuss about 97 of given number. ● The square root of 97 can be near to.		
Recaptulation **Home work**	Today we have learnt how to solve problem of 6.3 The students are asked to solve problems of 6.3 individually in their note books.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 9

III. **Teaching Point :** Cube roots - understanding **Duration** : 45 Minutes

IV. **The Academic Standards the students are to achieve**

(i) **Problem solving** :
- They can find cube roots of given number.
- Solve problems related to finding cube roots.

(ii) **Communication** : Express the given cube in mathematical language
Ex : $2^3 = 8$

(iii) **Connections** : The connect the cubic concept is used in finding three dimensional figures. Similarly in different mathematical areas such as Algebra, Geometry.

(iv) **Representation Visualization** : —

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings b) Observing Previous Concepts Brain stroming	Good morning students. Concepts learnt in previous periods are strengthened and recollected through following questions. ● What is the square ? ● What is the square of 3 ? ● What means by square root ? ● If a number is multiplied with itself what is it called ? ● How that is shown in mathematical language ? ● If some number is multiplied with itself thrice what is product called ?		Tex book, black board Chart showing 1-100 numbers.
c) Announcement of topic	Today we will learn about cubes of numbers and about cubic numbers.		
d) Relevance of the topic	In real life situations while finding volumes, areas of cubes. We use concept of cubes. There is need in real life situations wherein we may have to use cubic numbers concept.		
II. Presentation Conceptual understanding a) Reading	Read the pages of 139, 140 of text book thoroughly. Make the students to identify the key words numbers, symbols. Write the same on black board and develop understanding through various illustrative examples and through discussions by the following questions. Ex : Cube, Cubiod, Perfect Cube numbers		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
b) Activity-(1) Activity-(2)	If 1 is multiplied thrice what is the result ? If 2 is multiplied thrice what is the result ? If 3 is multiplied thrice what is the result ? If 4 is multiplied thrice what is the result ? ● What is products of a number with itself three times is called ? ● Similarly tell cubes from 1 to 20. ● What digit has came in unite place of 1 and 11 cubes? ● In numbers of unit place digits 0, 4, 6, 9 what digit will appear in its cube ?	The number obtained by multiplying the given number with itself thrice is called cube. $1\times1\times1 = 1^3 = 1$ $2\times2\times2 = 2^3 = 8$ $1^3 = 1 \quad 11^3 = 1331$ $2^3 = 8 \quad 12^3 = 1228$	
III. Problem Solving	Find the cubes of the following numbers and tell what digit appears in the unit place. (i) 8 (ii) 16 (iii) 21 ● By writing the above problem on black board and develop understanding by discussion through putting following questions. ● What are given numbers ? ● What is to be found ? ● To find cube what we should do ?	1) Find cubes of the following numbers and tell which digit comes in cubes of the numbers. **Sol :** The number obained by multiplying the given number with itself	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● How much is cube of 8 ? ● What is cube of 16, 2 ? ● Which digit appear on cubes of these numbers ?	thrice is called cube. Cube of 8 = 8×8×8 = 512 The units place digit in 8 cube 152 Cube of 16 is 4096 the units digit appearing in cube of 16 is 6. Cube of 21 = 9261 = 21×21×21 units place digit in cube of 21 is = 1	
IV. Model Problem Solving	I will write a model problem on black board and ask the students to write it down in their note books and solve independently and individually. After the students solving I will divide the students into groups and discuss the solution if small errors have occured I will encourage them guide them to rectify on the other hand if larger number of the errors occur I will take up another similar problem and discuss the solution. This way understanding is developed towards problem solving.		
V. Recaptulation	We learnt today what is the cube of a number ? What are their properties ?		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 10

III. **Teaching Point :** Cube roots - Arrangement **Duration** : 45 Minutes

IV. **The Educational Standards students should achieve**

(i) **Problem solving** : Students can find cubes of given numbers.

(ii) **Reasoning Proof** :
- They do the arrangement of cubic numbers. They state reasons for relationship with in the arrangement
- They generalise the arrangement and give reasons.
- They continue the arragnement of cubic numbers.

(iii) **Communicating** : Cubic numbers - they understand the arrangement and express in generalise form.

(iv) **Connections** : The concept of cubic numbers they can connect to solve the problems.

(v) **Representation Visualization** : The student can show the arrangement of cubic numbers in cubes.

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings	Good morning children.		Tex book
b) Observing Previous Concepts Brain stroming	The Concepts / points are to strengthened through putting the following questions. ● What is cubic numbers ? ● What is cube of 3 ? ● What are cube roots of 64 ? ● What can be formed by the arrangement of cubic numbers ?		Chart showing Cubic of 1-30
c) Announcement of the topic	Today we learn about cubic numbers and their araangement.		
d) Relevance of the topic	In real life situations the arrangement of cubic numbers concept is needed. Ex : Volume - Colours cubic box - That is the reason why we should learn about cubic numbers.		
II. Presentation Conceptual understanding a) Reading	From text book students are made to read pages 141, 142 under heading of interesting arrangements, cubic numbers and under the leading of factors the concepts are made clear by making the students to identify key words and writing them on black board. Ex : Cubic numbers, prime numbers triods, perfect cube		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
b) Activity-(1)	● What is cube of 1 ? ● What is square of 1 ? ● Or they both equal ? ● What is the sum of cubes of 1 and 2 ? ● What is the square of 1, 2 ? ● Are they equal ? ● What is the sum of cubes of 1, 2, 3 ? ● Are they equal ? ● What is the relationship between them ? ● What is hidden in this arrangement ? ● Can you extend it ?	$1^3 = 1^2$ $1^3+2^3 = (1+2)^2=3^2$ $1^3+2^3+3^3 = (1+2+3)^2=6^2$ $1^3+2^3+3^3+4^3 = (1+2+3+4)^2$ (.....) = (.....)	
Activity-(2)	● What is a prime factor ? ● What are the prime factors of 64 ? ● What are the factors of 216 ? ● If three same prime factors are grouped what is it called ? ● If a number has triods as prime factors, what you call those numbers ?	$64=2\times2\times2\times2\times2\times2$ $216=2\times2\times2\times3\times3\times3$ Every factor has occured exactly three times. Hence the prime factors called triods. A number which has prime factors not as triod is not a perfect square.	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
III. Problem Solving	The problem no 3, problem no 1 of pages 142, 143 of text are written on the black board and while discussing with children the problem solving method is made clear to students and understanding is developed. ● 1 cubic value equal to which square ? ● 1, 2 cubic values is how much ? ● How much is square of sum of 1, 2 ? ● Is cubes sum of 2, 3 is equal to square of sum of numbers ? ● What is sum of cubes of 1, 2, 3 ? ● What is square of sum of 1, 2, 3 ? ● Are these two above are equal ? ● Can you say similar thing on your own ? ● Can you continue this arrangement ? ● What is sum of cubes of first 'n' numbers cube is ? ● What is the number given in second sum ? ● What you have to find ? ● Express 540 as product of prime numbers ? ● In prime factorisation product how many times '3' came ? ● 2, 5 triods are present ? ● Can you say 540 perfect cube ?	$1^3 = 1^2$ $1^3+2^3 = (1+2)^2=3^2$ $1^3+2^3+3^3$ $= (1+2+3)^2= 6^2$ $1^3+2^3+3^3+4^3$ $= (1+2+3+4)^2 = 10^2$ $1^3+2^3+3^3+4^3+5^3$ $=(1+2+3+4+5)^2=15^2$ .... $1^3+2^3+3^3+.....+n^3$ $= (1+2+3+....+n)^2$ Is 540 perfect cube ? $540 = 2\times2\times3\times3\times5$ triods are no 1 present hence not a perfect cube	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
IV. Model Problem Solving	For children one model problem is written on black board and ask children to solve in their note books. After then solve the solution is made to be discussed in groups. If small errors are occured they are encouraged and guided to rectify them. If errors are more in number another similar problem is solved through discussin and problem solution is made clear.	**Problem :** By reducing into prime factors powers find whether 784 is a perfect cube or not.	
V. Recaptulation	Today we learnt what is cubic number and how to find cube root of a given number by prime factorisation. How to test whether given number is cubic or not.		

Period Plan (Timeline plan)

I. **Class :** 8 **Topic** : Mathematics

II. **Chapter 6 :** Square roots - Cube roots **Period No.** : 11

III. **Teaching Point :** Exercise 6.4 **Duration** : 45 Minutes

IV. **The Educational Standards set to achieve by children.**

(i) **Problem solving** :
- They can find cubes of given numbers.
- They can find the least positive number that is to be multipied or divided in order to make the given number perfect cubes.

(ii) **Reasoning - Proof :**
- Does the number given a perfect square ? or not they can state with reasons.

(iii) **Communication** : They can express cubes in mathematical language.
Ex : Cube of 5 is 5^3.

(iv) **Connections** :
- Cubes cube roots concepts are applied in Algebra, Geometry related fields. They can connect such application.
- The concepts of cubes are applied in real life situations. Students connect the application.

(v) **Representation Visualization** : Students can represent standard cubes in pictures, with given dimensions visualize the cubes, cubiods.

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings	Good morning children.		
b) Observing Previous Concepts Brain stroming	The previously learnt concepts related to current topic ar eobserved through the following questions. ● Students are shown cube cubes (3×3×3) ● In this cube how many cubes are there ? ● How can you say ? ● How you would write 27 in base of 3 ? ● What is cube of 4 ? How you would write in mathematical language ? ● Is 625 a perfect cube ? If not give reason ? ● What is the number on dividing by which the quoitent becames perfect cube ? ● Is cube of a odd number is odd ? Is cube of even number is even ?	3×3×3 = 27 3^3 = 27.	
c) Announcement of the topic	I would tell the students that utilising the concepts of cubes cubiod which you learnt in last class you will solve exercise 6.4 on your own. Hence we will learn method of solving problems.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
II. Presentation Total Class activity a) Reading	1. The problems of page 144 of text book no 144 are solved in the preferential order by discussion and illustrations in the following way. Problem (1) of exercise 6.4 ● Read the problem what are the numbers given ? ● What is to be found ? ● How you will find cubes ? I will discuss by making them to write cubes of given number. 2. Problem-2 of exercise 6.4 is solved by discussion with students. The discussion is held by putting the following questions. ● Read the problem. What numbers are given ? ● What is to be found in the problem ? ● How you will find whether given numbers are perfect cube 2 not ? ● Prepare a chart containing table of cubes 1 to 20? ● Now observe cubes in table ? ● All are perfect cubes ? What is the reason ? ● Next observe the numbers gien in problem compare with table are they perfect cubes ? This way the solution to problems is discussed.		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	3. The problem (3) of exercise 6.4 is taken up how the problem solved is discussed with students are as follows. ● Read the problem ● What information is given ? ● What is to be found ? ● Is 8788 perfect cube ? ● How you will find ? ● Can you write 8788 as prime factors product ? ● Next observe prime factors, is 8788 perfect cube? ● Now what least number is to be multiplied so that 8788 becomes perfect cube. Like this by discussing the problem in a similar way problems 4, 5 are too solved. 4. The solution of problem (6) of the exercise is presented to students through following discussion. ● Read the problem. ● What is the given information ? ● What is to be found ? ● How to find ? ● What is assumed as standard cube ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● The standard cube like them (in rows and columns). In are row 12, in another 8 rows arranged with cubes. How many standard cubes are needed. ● Now what is the shape of this cube-cuboid ? ● How many standard cubes are need if 3 row are placed on above the other ? ● Now this is in what shape ? ● Now feel to construct cubiods of dimension 12 cm, 8 cm, 3 cm how many standard cubes are needed ? ● I will instruct to solve the problems. 5. The problem 7 of exercise 6.4 is mode of solution is explained to students by discussion as below. ● Read the problem ● What is to be found ? ● How you will find $3^{11} + 5^{13}$? ● In 3^{11} what numbers are 3 and 11 ? ● The odd number is square of which number ? ● How can you say ? ● What would be cube of a odd number ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	• How can you say ? • Now tell me is 3^{11} is odd or even ? • How can you come with answer ? • What is sum of two odd numbers ? • How can you say ? • What is the least prime that can divide an even number ? Think ? • Similarly we can find least prime number that can divide $3^{11} + 5^{13}$. I will continue the discussion.		
III. Recaptulation	Today we using concepts of cube cube root solved problems of Exercise 6.4. We discussed methods of solutions of problems.		
IV. Home work	I would ask students to workout the problems of 6.4 exercise in their note book individually.		

Period Plan (Timeline plan)

I. Class : 8 **Topic :** Mathematics

II. Chapter 6 : Square roots - Cube roots **Period No. :** 12

III. Teaching Point : Cube roots finding **Duration :** 45 Minutes

IV. The Educational Standards that are to be achieved by students.

(i) Problem solving : They can find cube roots of given number (prim factorisation method).

(ii) Stating reasons - giving proof : They can find cube roots of given number and can give reasons.

(iv) Connections : The concepts of cubes, cube roots students can connect application, Geometry, Algebra different domains.

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction a) Greetings b) Observing Previous Concepts Brain Stroming	Good morning students. The concepts learned in previous periods is strengthened through discussion / putting following questions. ● What is perfect cube ? ● What is cube of 3 ? ● 64 is product of three equal factors what is the equal factor ?		Text books, Black Board, Chart containing 1-10 cubes Chart containing Cube roots

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● Among three equal factors what is single factor be called ? ● Can cubes too be arranged as of squares ?		
b) Announcement of the topic	Today we learn how cube roots are found.		
c) Relevance of the topic	● The concept of cube roots need arised in many situations in our real life situations. Ex : Volume, cube root, perfect cubes etc.		
II. Presentation Conceptual understanding Reading	Make the student to read information given in pages 144, 145 under cube roots. Make the students to identify the key terms, concepts, formulae. Write these on black board. Discuss the concepts with the students. Draw the answers out and fill the blanks. Ex : Cube, Cube root, Perfect cube roots	Cubes Cube roots $1^3 = 1$ $\sqrt[3]{1} = ?$ $2^3 = 8$ $= ?$ $3^3 = 27$ $= ?$ $4^3 = 64$ $= ?$ $5^3 = ... \_$ $= 5$	
a) Activity	● Tell me any of the perfect cube number ? ● Write that number as product of primes. ● Divide the primes as three factors of same number ? ● From the tiod of identical number take an factor from each triod ● Find the product of same factors taken in each group. ● What is product ? ● Wha is the product to numbers given ? ● How cube root is written ?	$64 = 2\times2\times2\times2\times2\times2$ $= (2\times2\times2)^3$ $= 82$	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
III. Problem Solving a) Activity	Find the cube root of 1728 by prime factorisation method. This problem is written on the black board. The solution of the problem is solved by discussing the method with students obtaining a series of questions listed below. This way the understanding of problem solution is developed among students. ● What is the given number ? ● Divide the number successively by primes and prime factorise ● Divide the numbers into primes triods. ● How many triods have come ? ● Find one number each from the triod find the product ● The product so obtained is called what for given number ? ● How cube root of a number is written ?	1. Find 1728 cube root by the method of prime factorisation Step-1 1728 = 2×2×2×2×2 ×2×3×3×3 Step-2 1728 - (2×2×2 (1) ×(2×2×2) (2) ×(3×3×3) (3) Step-3 : 2×2×2 $\sqrt[3]{1728}$ = 12	
IV. Model	Write problem no 15 from page 145 of text on black board. Ask the students to copy the problem in their note books and solve individually if they commit small errors guide them to rectify and encourage them to think in right direction. If errors are more in number another problem is taken up by writing it on the black board, explaining it thoroughly develop understanding.		
V. Recaptulation	Today we learnt how to find the cube roots of a given number through prime factorisation.		

Period Plan (Timeline plan)

I. Class : 8 **Topic :** Mathematics

II. Chapter 6 : Square roots - Cube roots **Period No. :** 13

III. Teaching Point : Estimating cube root **Duration :** 45 Minutes

IV. The Educational Standards that are to be achieved by students.

Stating reasons : Proving
Students can estimates cuberoots of given number and state reasons.

Expressing : Can expressing cube roots in mathematical language.

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings b) Observing of Previous Concepts Brain Stroming	Good morning students. The concepts learnt in previous periods are strengthened through the following questions. ● What is square of anumber ? ● What is square of 4 ? ● What is cube root of 27 ? ● How the cube root of bigger numbers ?		
II. Presentation (i) Conceptual understanding	Make students to read the content under the heading of Estimate from page 146. Students are to be made to identify the key terms. These terms are written on the	1. Estimate cube root of 64 ? 64 = 4×4×4	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
(a) Reading (b) Activity 1	black board and explained to total class. Evaluate cube root of 64. This problem is written on the black board. This sum is solved by discussing the concept through following questions. ● What is the number given ? ● What can be cube root of that number ? ● How can you estimate ? ● What are properties of cube roots ? ● Is there any other method to find cube root ?	Cube root = 4 Properties of Cube root	
	Find cube root of 9261. Problem is written on the black board. The solution is done by discussing with children by this problem solution understood by students. ● What is the given number ? ● What is to be found ? ● In first step the number is divided groups consisting of how many digits ? ● What number is left after dividing the number into groups ? ● In first group which digit is in units place ? ● If a number has 1 in units place its cube would have which number in units place ? ● 9 lies between which two cubes ? ● Which cube is closer to 9 ? ● Thus if we choose closer cube to 9 what is cube	1. Estimate cube root of 9261. **Step-1 :** Divide the given number from left begining from units place into group of three numbers each ? 9 261 IInd group Ist group **Step-2 :** In first group the units place digit is ..... 261 last digit is 1, which indicates the	

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	root of 9261.	units place digit in cubes **Step-3 :** Now observe number 9 in second group $23 < 9 < 3^3$ 2 is least $\therefore \sqrt[3]{9261} = 21$	
III. Relevance of the topic	● In every day life we came accross the situations in which we may have to estimate cube roots. **Ex :** Volumes, houses arrangement. That is the reason why we should learn about cubes and cube roots		
IV. Model Problem Solving	Write a problem on black board. Ask students to copy in their note books and instruct them to solve individually Divide the students into groups and make them to discuss the solution. If there are small errors committed allow them to discuss those and rectify on the other hand if bigger errors have occured other problem is writtein on black board and problem solving methods are made to understood.	Estimate 2197 cube root	
V. Recaptulation	Today we have learnt about estimating cube roots of given number.		

Period Plan (Timeline plan)

I. Class : 8 **Topic :** Mathematics

II. Chapter 6 : Square roots - Cube roots **Period No. :** 14

III. Teaching Point : Exercise 6.5 **Duration :** 45 Minutes

IV. The Educational Standards that are to be achieved by students.

(i) Problem solving :
- They find cube roots and state reasons.
- They can estimate cube root of a number and give reasons.

(ii) Expressing : The students can express cubes, cube roots in mathematical language

Ex : Cube root of 27 $\sqrt[3]{27}$ = 3.

(iii) Connecting : Utilising the square - cube concepts and with their interrelationship this can solve the problems.

(iv) Representaion : They can visuvalise squares and cubes in two dimensional, three dimensional.

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
I. Introduction			
a) Greetings b) Observing of Previous Concepts Brain Stroming	Good morning students. Through following questions the concepts pertaining to present topic understanding from previous classes is tested ● What is cube of 3 ? ● What is the cube root of 27 ? ● What is cube root of 1000 ? How can you say ?		Text book

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● 216 cube root ? ● How do you find cube root of 216 ? ● Through prime factorisation find cube root of 216.		
c) Announcement of the topic	Today we learn the problem solving methods of problems from 6.5 exercise.		
d) Relavance of the topic	I would tell the students that the concepts of cube - cube roots which learns in the previous classes are to be applied to solve exercise 6.5 individually. Today we will discuss the problem solving methods.		
II. Presentation	In the text book page no 146 Exercise 6.5 problems are taken up. These problems are solved through discussion which is taken up by putting a series of the following questions. 1. Problem (1) of Exercise 6.5 is solved by following discussion (Total activity) ● Read the problem ● What is to be found ? ● How 343 cube roots of 343 is found ? ● Can you write 343 as product of primes if so how ? ● What should be done after prime factorisation to obtain cube roots ? ● After observing the prime factorisation how many equal factors once to be taken to obtain cube roots ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● For 343 to find cube root what number which is repeated thrice must be taken ? ● What is the product of three numbers repeated will be for 343 ? 2. How to solve problem 2 of Exercise 6.5 is illustrated through following discussion. ● Read the problem ● What is to be found ● Can you estimate cube root of 1512 and tell ? ● How can you give cube root ? ● Observe cubes of 1 to 20 table. ● 1512 is between what perfect cubes ? ● Now tell me how much can be cube root of 1512 ? ● Similarly observe 2197 ? ● Can you estimate cube root of 2197 ? How much would it be ? ● Begining from unit place going towards left divide number into group of three. ● Is first group 197. Second 2 yes ? What is the digit in unit place of 197 ? ● If given number has 7 in unit place which digit can be in its cube root ? ● Why that number ? What is the reason ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	● Now is the given number which number is in second group ? ● 2 can be between which perfect cubes ? ● Does 13 < 2 > 23 hold ? From cubes write least number in tens place of give cube root. ● In this way given Big number is divided into groups and estimated. 3. Problem-3 of Exercise 6.5 is solved by illustrating every sentence of problem. Giving examples discussing the problem. Checking the truth value of sentences, and discussing, presenting appropriate reasons. 4. How to solve the problem (4) of Exercise 6.4 is illustrated through discussion with students by putting the following questions. ● Read the problem. ● When a number is called square ? ● When a number is called cube ? ● Can square number be cube number ? think ? ● The square of a two digit number consists of how many digits ?		

Teaching Learning Step	Teaching Learning Activities	Black Board Work	Teaching Learning Material Sources
	The cube of a two digits number consists of how many digits ? ● Write square of 1 to 9 in a task. ● Among 1 to 9 which number cubes have two digits ? ● Write cubes of 1 to 9. Which numbers have two digit numbers ? ● Next write cubes of 1 to 4. Observed. ● Which number square is equal to cube of other number. Observe and write. In this way how to solve the problem is explained to students.		
III. Recaptulation	I would convey that today we learnt cubes - cube roots concepts, solved problems from Exercise 6.5		
IV. Home work	The problems of Exercise 6.5 are assigned as homework the students are instructed to solve individually in their notebook.		

8 Continuous Comprehensive Evaluation

Evaluation is necessary to decide objectives and know how children are participating in teaching learning process ? How much understanded they got on concepts ? Are teaching learning process successful in achieving quality or standards of education ? etc. Now two types of evaluation are being conducted in schools viz., 1. Formative evaluation, 2. Summative evaluation. In this chapter we discuss about what and how to be evaluated through this evaluative process and how to prepare question papers

- What to the evaluated in Mathematies ? and How ?
- What points are to be kept in view in conducting Formative Evaluation?
- What are the points to be kept in view in conducting Summative Evaluation ?
- How we understand the mistakes of the children ? How these are useful in teaching learning process.
- What points are to be kept in view while preparing question paper.

A) What to be evaluated in Mathematics ?

By observing the Mathematics teaching objectives. We came to know that to conduct teaching learning process the points to be kept in view are like understanding about the components of number and space, enable to think mathematically, exploring logical conclusions from abstract thoughts, developing problems solving competency. From the above it is understood that the following are to be achieved through many mathematics lessons. They are

1. Problem solving.
2. Reasoning-proof.
3. Communication.
4. Connection/Relations.
5. Representative-Visualization.

Note : What to be done by students in a class ? (Basic processess). What to be known? (Basic concepts) clearly explained statements are educational quality of that class.

How to conduct Evaluation?

To assess the progress of the children, Formative evaluation and Summative evaluation are to be conducted as the part of evaluation.

Formative evaluation :

Formative evaluation has to be conducted to know how the quality of education being achieved during teaching learning processes. To assess the progress of children in Formative evaluation teacher has to apply the following steps in teaching learning process.

(1) Children participative and reflections.

(2) Children written work (Classwork, Homework, Portfolios, Assignments etc)

(3) Slip Test.

(4) Children projects.

The above steps can not be conducted as test in a stipulated time and period except as part of teaching learning process. That means during teaching lessons, We discuss with children, conduct activities, ask questions, make them to solve problems on black board, give home work, conduct sliptest, ask to write opinions, to prepare report on assignments, to collect photos and information, to conduct projects etc. We are able to understand move about the children, try for their development, make them to learn after assessing their progress after considering the above points only. It is necessary

1. Children participation and reflections (Questioning-Discussing-make to question) :

How children are participating in activities during teaching lessons ? We have to observe how children are answering to teachers questions. By solving examples children understand the

concepts and able to generalise, formulate and prove. To know how far these concepts are understood, we have to observe whether all children are able to do the activities like try - think - discuss; discussing with peer group, participating in groups, expressing opinions, deciding. Then the progress of children has to be assessed.

2. Children's written work (Class work, Home work, portfolio, assignments etc) :

Note books, Home work copies, children dolving problems on BlackBoard, Tables in Text Books, solving problems, Assignments, portfolio are to be observed as part of written, work. Whether solved problems, collected informations, expressed opinions are in a right way or not, whether they reflect the quality of education have to be verified. That means lessons, concepts, activities have been conducted as part of teaching learning process. Example problems have been explained.

Children who understood concepts and examples are whether solving problems of 'Do this' in their note books by themselves or not to be observed and also whether they are doing homework and how they are doing in class room. Children have to solve problems by themselves. In any circumstances they should not copy them from guide or from other's note books. If they do so they would be given zero marks. They would be given marks or grades if they solve by themselves only. Assessment of the progress of children would be done as part of Formation Evaluation by understanding mistakes done in projects and assignments given, changing teaching learning process, adopting new methods and giving suggestions to children.

3. Slip Test

Slip test is the test conducted then and there. For this purpose there is no need to inform students before hand and no need to plan. Teacher can conduct slip test during general teaching learning process. It is meant to achieve particular educational standards / capacities basing on one or two points / concepts related to subjects. Slip test could be conducted during teaching of a unit.

4. Project works

While conducting teaching learning process, work / project works have been allotted. Project work could be done in individuals or in groups. For this purpose children have to collect information at field level, to record in tables to analyse information express / communicate opinions, to represent in graphs and diagrams. After observing these, teacher has to discuss, question with children individually or in groups according to the project. After verifying the report submitted with discremination and with suitable basis, the progress of the children would be assessed.

Formative Evaluation - Table

S.No.	Name of the student	Marks to be achieved - Grade				Total Marks	Grade
		Reflections of Children 10 Marks	Written work 10 Marks	Project work 10 Marks	Slip Test 10 Marks		

Summative Evaluation

Summative Evaluation is meant to know how far children achieved educational standards in lesson in a particular period. Children would be informed about the date and time of conducting summative evaluation. The written examination would be conducted for two and half hours in all lesson completed till the date of summative evaluation. Teacher has to observe keenly the answers written and assess the progress of the children. For this purpose the procedure given below would be followed.

Summative Evaluation - Table

S.No.	Name of the student	Marks achieved with respect to competencies - Grade					Total Marks	Grade
		Problem solving (40 Mks)	Reasons and proof (20 Mks)	Commu-nication (10 Mks)	Connection or Relation (15 Mks)	Represen-tation (15 Mks)	(100 Mks)	

- Teacher has to prepare question paper subjectwise basing on the educational standards decided.
- There are no need to conduct oral test separately. Teacher can record oral test marks basing on his own observations or on the Formative Evaluation recorded. Basing on these points progress of the children would be assessed.
- Question paper would be prepared on the educational standards alloted for written test and subjectwise weightages decided.
- Summative Evaluation would be conducted twice in one Academic year. So the first one in the month of October, the second one in the month of March or April would

be conducted. To prepare the question paper for the first summative evaluation, the syllabus completed till October would be considered, for the second summative evaluation the whole text book that means all the lessons would be considered. The syllabus would be 60% to 70% of the topics from second part and 40% to 30% of the topics from first part.

- The importance would be given to all type of question in preparing summative question paper viz eassy type, small answers, fill in the blanks, multiple choice etc.

In the above two evaluations, child's progress will be assessed by observation oral and written tests in Formative evaluation where as in Summative Evaluation, the assessment would be by written test only. But in primary classes viz 1 and 2 classes importance would be given to oral evaluation.

While conducting evaluation in teaching learning process, one should know that achieving educational standards is most important. Giving importance to the achievement of these, conducting activities, discussions, collecting opinions should be done. Through this progress of children would be assessed. For this purpose, Formative Evaluation would be conducted in July, September, December, February months and Summative evaluation in October, March or April months.

Points to be kept in view which conducting Formative Evaluation and Summative Evaluation :

- **To assess the progress of children :** We are limited to written examinations only till today. So the following points are to be kept in view along with written examination in assessing the progress of children.

  1) Children participation and reflections.
  2) Written work (Notebooks, Assignments, Portfolios)
  3) Slip tests
  4) Project works
  5) Written test based on Academic Standards.

  In the above mentioned tools, participation - reflections, slip tests and written works would be used as tools for Formative Assessment and Written Test based on the standards of education would be used as tools for Summative Assessment.

- Continuous Comprehensive Evaluation (CCE) is a continuous process. By assessing the progress of children teachers have to provide suitable help and for development. For this purpose it is not logical to use questions papers prepared by same other person or institute. So the most important in CCE is to prepare question papers by teachers and basing on the lesson taught.
- Generally questions are content based from text book. But now the educational standards to be achieved in Academic year are decided. Teaching learning proceess are used to achieve educational standards. So the importance would be given to achieve these in evaluation. For this purpose question papers would be prepared basing on these educational standards.
- Activities, questions and projects given in evaluation would be such that they make children to think, to write multiple answers, to interpret, to apply their experiences, to express opinions.
- Problem Solving : Problem that given to children for educational standards are very complex and many problems are word problems, picture problems, Data understanding-Analysis, Tables-Graph, problems solving according to methods. Complexity would be based on different concepts, coordinating in daily life, number of steps in problem, nember of processes in problem, information given to solve problem, naturality of the method to solve problem.
- **Reasoning - Proof :** Problems related to educational standards would contain these points. Formative and summative evaluation would be conducted keeping in view of such as explaining reason for stagewise steps, mathematical generalisation and understanding the imagination and solving problems, verifying problems, examining logical acts, understanding the line of proof in problem, examining mathematical projects, applying logic in inductive and deductive methods.
- **Communication :** While conducting Formative and Summative evaluation keeping this as educational standard, the children would be given the problems with mathematical communications, reading and writing concepts, and sentences, explaining mathematical thoughts in own words, explaining problem method and logical reasoning.
- **Connection :** Either activities or evaluation would be to achieve the following. The activities given in this educational standards enable to coordinate the concepts of numbers, addition, subtraction, multiplication, division, ratio, symmetry, measurements and plane / space, co-ordinating these concepts to dialy life, co-ordinating mathematical

points to the points in different subjects, co-ordinating different concepts within mathematics, co-ordinating concepts to multy methods. By conducting evaluation activities the progress of children would be achieved.

- Representation and visualization : The following points should be kept in view while giving activities, problems and questions to evaluate this educational standard.

  (1) Problems to read information in the table, problems to read number line, pie diagram, bar diagram 2D and 3D diagrams.

  (2) Developing tables, noticing on number line, problems related to draw diagrams, bar diagrams and diagrams.

- Tools to conduct classwise formative evaluation, summative evaluation, educational standards to be observed and their weightages are given in table below. To achieve the decided objectives, the points given in the table below are to be kept in view.

Mathematics - weightage table

Class	Topic	Formative					Grade	Summative										
		Participation Reflections	Note Books	Project	Written Test	Total		Problem Solving		Reasoning & Proof		Communi-cation		Connection		Represent & Visualisation		Total
								Oral	Writ-ten	Oral	Writ-ten	Oral	Writ-ten	Oral	Writ-ten	Oral	Writ-ten	
1-2	Weightage	20%	20%	20%	40%	100%		10%	40%	10%	-	-	10%	10%	-	10%	10%	100%
	Marks	10	10	10	20	50M		5	20	5	-	-	5	5	-	5	5	50M
3-5	Weightage	20%	20%	20%	40%	100%		50%		20%		10%		10%		10%		100%
	Marks	10	10	10	20	50M		25		10		5		5		5		50M
6-9	Weightage	20%	20%	20%	40%	100%		40%		20%		10%		20%		10%		100%
	Marks	10	10	10	20	50M		40		20		10		20		10		100M

c) Points to be kept in view while developing question paper :

- Question paper should be prepared for slip test in Formative evaluation and summative evaluation.
- Slip test would be prepared for 20 marks for I to X classes in Formative evaluation. In summative evaluation 50 marks question paper for I to V classes and 100 marks question paper for VI to IX classes should be prepared.

- In summative evaluation problem would be given on the basis of tyeps and number of questions instructed in the weightage table.

Weightage table :

S.No.	Type of questions	Primary level			High School level		
		Questions	Marks	Total	Questions	Marks	Total
1	Essay	4	5	20	4	10	40
2	Short type	8	$2\frac{1}{2}$	20	8	5	40
3	Very Short type	5	1	5	10	1	10
4	Fill in the blanks & multiple Choice Questions	5	1	5	20		10

In summuative evaluation, which developing question paper for primary classes, 50% weightage to questions related to problem solving educational standard and 50% weightage to remaining educational standards. At elementary stage 40% weightage to problem solving and remaning 60% weightage to other educational standards to be allotted. At least 10% to 20% more wieghtage could be given to each educational standards according to the topics of chapters except problem solving observe the above weightage table. However the total percentage would not exceed 60% (That means weightages would be as per the weightage table or 20% 15%, 15% and 10% or 20%, 15%, 10%, 15% or 20%, 10%, 15%, 15%)

$\frac{1}{2}$

Class-wise, educational standards wise weightage table - Summative

Class	Topic	Problem Solving	Reasoning & Proof	Communica-tion	Connection	Representa-tion & Visualisation	Total
1 - 2	Weights	50%	10%	10%	10%	20%	100%
	Marks	25	5	5	5	10	50
3 to 5	Weights	50%	20%	10%	10%	10%	100%
	Marks	25	10	5	5	5	50
6 - 9	Weights	40%	20%	15%	10%	15%	100%
	Marks	40	20	15	10	15	100

- As 40% weightage to oral test given and 60% to written test is being given to I and II classes, the question paper for oral test would contain questions with small numbers and small sentences "written test should be conducted for elementary classes 3 to 5. So weightage table should be kept in view to prepare question paper.
- Essay type questions would be like primarly written problems or with logical thinking or with two or three operations or thought provoking problems. Any how no short type questions and more less than these should be there. At elementary stage theroms, constructions, solving equations, graphs etc would be given as Essay type questions.

Weightage table fore 1, 2 classes, Summative - written - oral test

Topic	Problem Solving		Reasoning Proof		Communication		Connections		Propose/ Substitute		Total
	Oral	Written	Oral	Written	Oral	Written	Oral	Written	Oral	Written	
Weightage	10%	40%	10%	–	–	10%	10%	–	10%	10%	100%
Marks	5	20	5	–	–	5	5	–	5	5	50

- Short type questions should be with one operation and with direct answer. Figure problems, problems with 4 to 5 steps, problems with small analysing points may be given.
- Very short questions may contain small problems, oral problems, definitions, formulas, symbols, problems with twist may be asked.
- Objective type questions should be like that they may be solved orally in less time. Problems with more operations and counting should not be given.
- In any circumstances short types, very short type questions should not be equal to the level of Essay type.
- Essay type, short type, very short type, objective type questions should be thought provoking and able to achieve educational standards.
- Essay type questions may be with more questions to choose or may be choice with in two questions. Remaining type questions should not contain any extra questions. One type of questions should be at same level.
- Graph or activity or situation or information tables may be given as part of Essay type question. 10 marks question or 5 marks questions may be given.

How the mistkaes done by the children are being understood ?

Continuous Comprehennsive Evaluation is not a traditional general examination. The process of recording the observations of childrens physical, mental, social, emotional developments before teaching lessons, during teaching learning process, after teaching lessons, in the laboratory, library, in play ground, in situation of dialy life application is a process of Assessment for learning. So children participate in teams/groups, discuss with teacher, question, exhibit, communicate their opinions in oral and written modes, during teaching learning process, conducting activities, and projects, and games / sports etc. Basing on these, the progress of children would be assessed.

When children communicated / expressed their opinions orally and when discussing during teaching learning process, the mistakes of children in learning may not be noticed once ro twice may be explained. If necessary they may be asked to repeat twice. When children do mistakes in written work, it is observed and brought to their notice. But it children do mistake in answering orally, they should not be misunderstood because they also have discrimination capacity. So reason for mistake should be find out. We have to analyse whether he has difficulty in understanding or he misunderstood concepts ? or not able to read and understand the problem / or not able to analyse ? He would me made to recognise his mistake in the anser and to correct it. Explanation should be given.

For this purpose, the language, words, technical terms ect used during teaching learning process should be kept in view. Importance should be given to simple language that can be understood by children and instructions.

Children are not able to apply formed concepts in written test, why ?

Children are using their mathematical concepts in their dialy life. Children are not able to apply concepts due to the mistakes done in written examination. So the mathematical vacabulary has importance in class room. Children would be provided number of exercises in class room. Vacabulary would be introduced and co-ordinated with dialy life. For example a student has solved the following problem like this.

If $-2x = 0$, then $x = 2$.

As a teacher, it is necessasry to know the reason for the mistake done by the student. Children usually do this mistakes as they have no understanding about Alzebrical equations. If we want that this mistake should not be repeated, situations about equations - processes should be provided for understanding.

Firstly understanding about 2x, 3x, 4x should be provided as follows :

$$x + x = 2x$$

$$x + x + x = 3x$$

$$x + x + x + x = 4x$$

Then what is 2k = 0 ?

$$x + x = 0$$

When the value of x = 0, then only it is possible, likewise discussion should take place for 3x, 4x. Then children are able to understand that if - 2x = 0, then x = 0.

Summative Question Paper

Student Name : ..... Class : 8th

I. Problem Solving

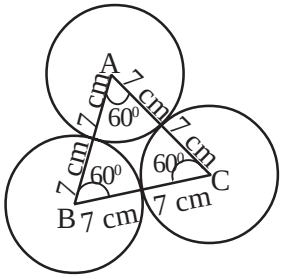
1. Solve any one of the following. (1 × 10 = 10M)

   (a) Neelima went into a shop to buy cloths. The marked price of clothes she selected is ₹ 1000. The shopkeeper gave her discount of 20%, first further 5%. Then find how much discount does she totally got.

   (b) Find the sum of numbers that are lying between 1 to 100 which are divisible by 2 or 3.

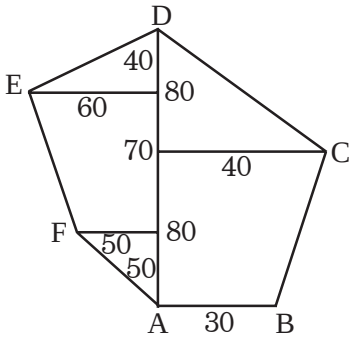
2. Solve any one of the following sum. (1 × 10 = 10M)

   (a) There is a equilateral triangle with area $49\sqrt{3}$ Sq. Cm. Three circles with the vertrices as centres touch each others externally as shown in figure. Find the area of the triangle that is not common to the circles.



(OR)

   (b) Find the area of the field given below. The measurements are given in meters.



3. Solve the following problems (4 × 5 = 20M)

   (a) Write in p/q form

   (b) Simplify

(c) Do the division $26z^3 (32z^3 - 18) \div 13z^3 (4z - 3)$

(d) z varies directly with 'x', while there is 20% decrease in variable x find increment in z.

II. Reasoning - Proofs

4. Solve the following (2 × 5 = 10M)

(a) Draw different rectangle are they similar ? Explain. Find the ratio of areas and perimeters what do you observe ?

(b) $n^3 - n$ is divisible by 3 explain ?

5. Explain the following. (5 × 1 = 5M)

(a) Does the factors of 24, 6 divisible by 2, 3 ?

(b) All the faces of cube are same ?

(c) Is $a(a - 2) = a^2 - 2a$ is identify ? Why ?

(d) There is no perfect cube ending in 8.

(e) Rahaman said if 4x and 7y are added we get 11xy. Is this true ?

6. Answer the following sums. (10 × = 5M)

$\frac{n+1}{2}$ $\frac{}{2}$

(a) Every natural number, every integer is a rational number ?

(b) To construct a quadrilateral 5 independent measurements are needed if 4 are given which measurement (5th) is need ? Why ?

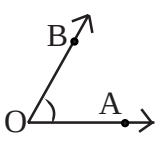
(c) 2x : 3 : 5x is equal to 2 : 3 : 5 why ?

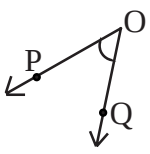
(d) $a^{m+n} = 1$ when ? How ?

(e) Ave 2, 3, 4, are pythogoras triods ? Why ?

(f) Of the total 'n' observations the observations are written in attending order if n is even

then its median is th observation why ?

(g) 



When does these two figures are congment ?

(h) 'A circle angle is 180^o. Length of arc is πr then explain relationship between angle of sector and arc length.

(i) 7xy has 1 as factor ? Explain ?

(j) Explain "Euler" relation with help of cube

III. Communication

7. Solve the following problem.

(a) Write a directly proportional, inversally proportional incidents you observed.

8. Answer the following.

(a) Give total surface area of the cubiod with l, b, h measurements.

(b) Write $24 x^3 \div 3x$ in product form.

(c) A = × h × (a+b) write it in sentence

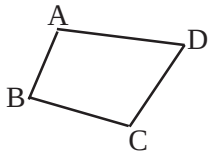
(d) If = what does indicate

(e) Represent a fraction in which numerator is 6 less than denominator.

(f) If a, b, c are any three rational numbers write associate property.

(g) Write like term of $5pq^2$.

(h) State product of a monomial, binomial

(i) 

State formula for finding area of adjacent figure.

IV. Connections (20 Marks)

9. Solve the following problems

(a) The perimeter of a rectangle is 35 M without altering the perimeter length is increased by 1 M. That leads to changes in its breadth and area fill up the blanks in the table given below based upon those values boserve how the area changes depending upon changes in length. What do you observe ? State your observations.

Length (Cm)	1	2	3	4	5	6	7	8	9
Breadth (Cm)	11	10							
Area (Sq. Cm)	11	20							

(b) On a graph paper or an zeo board draw A rectangle. Construct a similar triangle. Find the perimeters and areas of both figures find ratios and compare with sides ratio.

V. Representation : (1 × 5 = 5M)

10. Solve the problem.

(a) For the following data constuct a frequency distribution table and draw both Ogive curves.

Marks	Less than 5	Less than 10	Less than 15	Less than 20	Less than 25
Student No	2	8	18	27	35

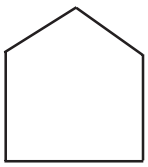
(b) In the following frequency distribution table the wages of 250 labour is given. Draw a histogram, frequency distribution polygon on same graph paper.

Weekly wages	500-550	550-600	600-650	650-700	700-750	750-800
Labourers No	30	42	50	55	45	28

11. Solve the following problems.

(a) Represent a cubiod with dimensions 5 units × 3 units × 2 units on a zero board.

(b) Divide following figure into shapes as instructed.



3 triangles

(c) Write $3^4 \times 3^{-5}$ as single exponent number.

(d) Draw a solid without having single vertex.

(e) Using any primary picture form decilations.

Summative Question Paper

Student Name : ..... Class : 9th

I. Problem Solving (1 × 10 = 10M)

1. Solve any one of the following problems.

(a) In world cricket the cricketers who made cneturies numbers are given below.

Centuries	5	10	15	20	25
No of players	56	23	39	13	8

Find mean and median for the above table.

(OR)

(b) In a high school the donations given by students for an orphanage is given below in rupees.

Class	6	7	8	9	10
Donation of each Student	₹ 5	₹ 7	₹ 10	₹ 15	₹ 20
No of Students	15	15	20	16	14

Find for the above details median and mode.

2. Solve any one of the following sum. (1 × 10 = 10M)

(a) In a parallelogram opposite angles are $(3x^2 - 2)^0$ and $(x+48)^0$. Then find all angles of the parallelogram.

(OR)

(b) In ΔABC on AB D is a point such that AD = $\frac{1}{4}$ AB. Similarly E is on AC such that

AE = AC. I / DE = 2 cm. Find BC.

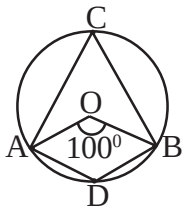
3. Solve the following problems.

(a) Write in form.

(b) When $2x^3 - 3x^2 + ax + b$ is divided by x-2 remainder is 2. When divided by x+2 remainder is 2. Find a, b values ?

(c) The radius of base of a right circular cone of lateral surface area is 158.4 sq. cm is 5.6 cm. Find its slant height and vertical height ?

(d) In figure find $\angle ADB$. 0 is centre.



II. Reasoning - Proving

4. Solve the following problems. (2 × 5 = 10M)

(a) "In a triangle, show that sum of any two sides is greater than the third side" prove.

(b) Show in Rhombus diagonals are perpendicular.

5. Write answers for the following sums.

(a) Is (x + 2) a factor of $x^3 + 2x^2 + 3x + 7$. How can you say ?

(b) "Two distinct lines cannot have more than are common point" prove.

(c) For an ungrouped data while finding the median the data is to be arranged in either ascending or descending order why ?

(d) In ABC quadrilateral AB = CD, BC = AD, and AC is diagonal then prove ΔABC ΔCDA

(e) If three identical coins are tossed at once what is the probability of outcomes of getting head, and no tail. What is the reason.

6. Answer the following sums. (10 × = 5M)

(a) can be written as can this be called rational ? or not why ?

(b) = $\left(Q^q\right)^p$ is true or not.

(c) n is not a perfect square and natural number then what can be $\sqrt{n}$. How can you say ?

(d) Two intersecting lines cannot be parallel to a single line why ?

(e) Each angle of triangle which is equaalateral is 60^o. Why ?

(f) In a rectangular the diagonals are equal but not in parallelogram why ?

(g) In coordinate plane (5, -3) lies in which duodrant ? How can you say ?

(h) The volume of right circular cylinder is $\pi r^2 h$ why ?

(i) Among $\sqrt{2}$, , which is irrational number why ?

(j) Does 1 Sq. M = 100^2 cm true why ?

III. Communication (1 × 5 = 5M)

7. Solve the following problems.

(a) $V = \pi r^2 h$ explain.

(b) Write coordinates of the point which is 3 units from x-axis 5 units from y axis.

(c) Write radical form of

(d) The surface area of sphere is equal to 4 times the area of circle of same radius. Write this as formula.

(e) Write the division alogor them when P(x) is divided by x-a, and Q(x) are quoitent and remainders is P(a).

8. Write answers to the following.

(a) In P = 2(l+b) what does l indicate .....

(b) Write streaight line AB in symbolic form .....

(c) Write general form of linear equation .....

(d) The coefficience of x is 7 write the term .....

(e) How the sum of frequencies is indicated .....

(f) Write general form of quodratic equation .....

(g) Write simplified form of 3.015715715715718 = ...

(h) Straight liines AB, CD are parallel lines. Write symbolically .....

(i) The probability of an event lies between 0 and 1 write this using symbols .....

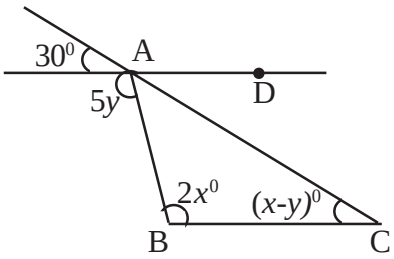
(j) In what does indicate

Connections

9. Solve the following

(a) In 28 liters of milk the ratio of milk water is 5 : 2 then form the equation representing this. Draw a graph for this from this find volume of milk in the given mixture.

(OR)

(b) 

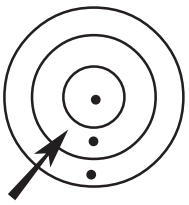
From the adjacent figure for what values of x, y AD, BC lines are paralle.

10. **Solve the following problems**

(a) A building is cylinder sur mounted by hemisphere. The upper part has base circumference 17.6, the cylindrical hight is 7 m. What would be the cost of painting the building at the rate of ₹ 5 per 10 Sq. M.

(OR)

A dart board is made of three cocentric circles as shown below.



The circles radius 20 cm, 10 cm, 5 cm. If a javalin is thrown what is the probability that it strikes the area marked A.

11. Solve the following problems.

(a) $\frac{x}{2} - \frac{y}{3} = 3$. Draw graph for this equation.

(b) Indicate $\sqrt{2}$ on number line.

Teaching Practice - Guidelines

- Teaching practice - guidelines (How many lessons - How many periods)
- Train teachers should practice teaching.
- Two methodology teaching practice is to be done.
- One subject of co-curricular ativities is also to be taken for teaching practice.
- In non language subjects (Maths - Social - Science) compulsory 20 periods are to be taught.
- If a teaching lesson is more than 20 periods those extra periods are also to be taught because a total lesson/unit must be taught. If by chance a unit/lesson is completed within 20 periods. Then next lesson is to be taken and 20 periods teaching must be completed.
- Two periods are to be allotted for co-curricular activities. For these periods too period plan must be written and periods are to be taught.
- For each methodology one should write 20 period plans. From this 20 periods 5 period. Plans digits (ICT) are to be designed and taught.
- Comprehensive Continuous Evaluation (CCE) is integral part of teaching practice. So while teaching the formative assessment should take place.
- After the completion of teaching practice Summative Assessment test must be conducted for this purpose Comprehensive Evaluation Question Paper must be prepared. The

test is to be conducted and after correcting the Answer scripts. Grading must be recorded.

- Based upon Comprehensive Continuous Evaluation SAT record must be completed.

What should happen before teaching practice

- In college a workshop is to be conducted and year plan must be prepared.
- For trainee teachers - the format of year plan must be explained.
- Afterwords trainee teachers are to be divided into groups. The year plan must be prepared by discussions within the groups. If necessary guidance/help must be provided.
- The year plans prepared by groups are to be displayed. There should be discussion on this in class.
- Afterwards the trainee teachers should prepare individually a year plan.
- In similar way workshops are to be organised for preparation of unit plan / lesson plan.
- The teaching steps are to be exhibited in the college itself.
- Based upon Academic Standards how period should be taught is to be made clear to train teacher by a demo.
- In each subject five lesson are to be taught in the presense of lecturer.

What should happen during teaching practice

- The trainee teachers should maintain registers of lesson plan, period plan.
- TLM material that is need for teaching should be ready with them.
- While teaching taking place
  - is period plan being implemented ?
  - is formative assessment taking place ?
  - Are the questions are thought provoking ?
  - Are questions are put between the lesson ? like wise are activities are held ?
  - Current issues are incorporated in lesson !
  - The group activities are being organised ?
  - Individual activities are taken up ?
  - TLM is used ?
  - Evolution is being taken place ?

Above teaching points are taken place or not are to be observed, subject teachers too should keep the above in mind while teaching to trainee teachers.

- నిర్మాణాత్మక మూల్యాంకనం – పిల్లల ప్రగతి నమోదు.

క్ర.సం.	పిల్లల పేరు	సాధించిన మార్కులు				మొత్తం మార్కులు 50 M	గ్రేడు
		పిల్లల ప్రతిస్పందనలు 10 M	రాత అంశాలు 10 M	ప్రాజెక్టుపని 10 M	లఘు పరీక్ష 10 M		

- సంగ్రహణాత్మక మూల్యాంకనం – ప్రగతి నమోదు

క్ర.సం.	విద్యార్థి పేరు	సామర్థ్యాల వారీగా సాధించిన మార్కులు					మొత్తం మార్కులు	గ్రేడు
		సమస్యసాధన 40 M	కారణాలు – నిరూపణలు 20 M	వ్యక్తపరచడం 10 M	అనుసంధానం 15 M	ప్రాతినిధ్య పరచడం – దృశ్యీకరణ 15 M		

- వార్షిక / చివరి ఫలితం

క్ర.సం.	విద్యార్థి పేరు	నిర్మాణాత్మక మూల్యాంకనం మార్కులు	నిర్మాణాత్మక మూల్యాంకనం గ్రేడు	సంగ్రహణాత్మక మూల్యాంకనం మార్కులు	సంగ్రహణాత్మక మూల్యాంకనం గ్రేడు	నిర్మాణాత్మక, సంగ్రహణాత్మక మొత్తం మార్కులు	చివరి ఫలితం గ్రేడు

- సామర్థ్యాల వారీగా విశ్లేషణ పట్టికలు.
- గ్రేడింగ్ విశ్లేషణ : సబ్జెక్టులు

తరగతి	మొత్తం విద్యార్థుల సంఖ్య	A+	A	B+	B	C

- పిల్లల అభ్యసన సమస్యలు (ఏయే సామర్థ్యాలలో వెనుకబడి ఉన్నారు?)
- ప్రత్యామ్నాయ బోధన, కార్యాచరణ ప్రణాళిక (పిల్లలు వెనుకబడిన సామర్థ్యాలను తిరిగి సాధించడానికి కార్యాచరణ ప్రణాళిక తయారీ)
- ముగింపు.

Maths Teaching Sources

For any successful teaching learning activities the sources that are used play very important role. By sources it would be wrong to assume only those sources which are to be utilised during teaching learning activity taking place. In the process of making children to understand concepts of mathematics the teacher should use some sources for his preparation to teach that is before entering into class room. He should make student to realise the need of such sources to develop complete understanding of concepts and encourage them to use such sources.

The teacher should not limit himself to person information given in prescribed text. He should collect the information that is related to concept additionally and develop understanding among children. He should utilise it in his teaching learning activities. He should design such activities. For this he could use mathematical tool box, Information Communication Technology (ICT), Audio-Visual aids are also useful in this regard - He should utilise interrest too. The websites which can be browsed for such information is provided here under.

Websites

General

The mathforum@ Drexel University (http://www.mathforum.org)

The Centre for Innovation in Mathematics Teaching (CIMT) (http://www.cimt.plymouth.ac.uk)

Math cats – Fun math for kids (http://www.mathcats.com), count on (http://www.counton.org)

1. Illuminations - Resources for teaching maths (http://illuminations.nctm.org) Interactive (http://www.shodor.org/interactivate)

Gadsen Mathematics Initiative (http://www2.gisd.k12.nm.us/GMIWebsite/ImathResources.html)

2. Mathematical Interactivities – Puzzles, games and other online educational resources (http://mathematics.hellam.net)

3. National Library of Virtual Manipulatives (http://nlvm.usu.edu/en/nav/vlibrary.html)

4. Mathnet – Interactive mathematics in education (http://www.mathsnet.net)

NewZealand maths (http://www.nzmaths.co.nz)

The Mactutor History of Mathematics archive (http://www.history.mcs.st-and.ac.uk/history)

Math cartons (http://www.trottermath.net/humor/cartoons.html)

Math Comis (http://home.adelphi.edu/~stemkoski/mathematrix/comics.html)

Mathematical quotation server (http://math.furman.edu/~mwoodard/mqs/mquots.html)

Wolfram Mathword – The web's most extensive mathematical resource (http://mathworld.wolfram.com)

Optical illusions and visual phenomena (http://www.michaelbach.de/ot)

Optical illusions gallery (http://www.unoriginal.co.uk/optical5.html)

Teachers resources online (http://www.cleavebooks.co.uk/trol/index.html)

Interactive : Activities (http://www.shodor.org/interactive/activities/#fun)

Maths articles (http://www.mathgoodies.com/articles)

Math words and some other words of interest (http://www.pballew.net/etyindex.html)

Portraits of scientists and mathematicians

(http://www.sil.si.edu/digitalcollections/hst/scientific-identity/CF/display_results.cfm?alpha_sort=R)

Let epsilon < 0 (http://epsilon.komplexify.com)

Grand illusion (http://www.grand-illusions.com)

Portrait gallery – Mathematicians (http://mathdl.maa.org/mathDL/46/?pa=content&sa=viewDocument&nodeid=2437&bodyId=2241)

Maths teaching ideas (http://www.teachingideas.co.uk/maths/contents.html)

E-books

Illustrated maths formulas – salim (http://www.arvindguptatoys.com/arvindgupta/mathformulas.pdf)

Ramanujan – the man behind the mathematician Sundaresan and Padmavijayam (http://gyanpedia.in/tft/Resources/books/ramanujan.doc)

A mathematician's apology – G.H.Hardy (http://math.boisestate.edu/~holems/holmes/A%20Mathematician%27s%20Apology.pdf)

Puzzle maths – G.Gamov and stern (http://www.arvindguptatoys.com/arvindgupta/puzzlemath.pdf)

1000 uses of a hundred square – Leah Mildred Beardsley (http://www.mediafire.com/download.php?detnojrueje)

Geometry comic book – Jeane Pierre Petit (http://www.mediafire.com/?ud0nnnujzyy)

Elements – Eucid (http://www.mediafire.com/?ud0nnnujzyy)

How children learn mathematics (http://gyanpedia.in/tft/Resources/books/mathsliebeck.pdf)

Suggested experiments in school mathematics – J.N.Kapur (http://www.arvindguptatoys.com/arvindgupta/jnkapur.pdf)

Primary resources – Maths (http://www.primaryresources.co.uk/maths/maths.html)

Proteacher! Maths lesson plans for elementary school teaches (http://www.proteacher.com/100000.html)

Maths activities (http://www.trottermath.net/contents.html)

Maths powerpoints (http://www.worldofteaching.com/mathspowerpoints.html)

Maths is fun – maths resources (http://www,mathsisfun.com)

Middle school portal for maths and science teachers (http://www.msteacher.org/math)

Maths games, maths puzzles and maths lessons designed for kids and fun (http://www.coolmath4kids.com)

Numbers

Magic, squares, magic stars & other patterns (http://recmath.org/Magic%20squares)

Number recreations (http://www.shyamsundergupta.com)

Broken calculator – Maths investigation (http://www.woodlands-junior.kent.sch.uk/mahts/broken-calculator/index.html)

Calculator chaos (http://www.mathpalyground.com/Calculator Chaos.html)

Primary school numeracy (http://durham.schooljotter.com/coxhoe/Curriculam+Links/Numeracy)

Quarks to Quasars, powers of 10 (http://www.wordwizz.com/pwrsof10.html)

Algebra

Algebra puzzle (http://www.mathplayground.com/Algebra_Puzzle.html)

Algebra tiles (http://mathbits.com/MathBits/AlgebraTiles/AlgebraTiles/MathBitss07ImpFree.html)

(http://mathbits.com/MathBits/AlgebraTiles/AlgebraTiles/MathBitss07ImpFree.html)

Geometry (http://www.cyffredin.co.uk)

The Fractory : An interactive tool for creating and exploring fractals (http://library.thinkquest.org/3288/fractals.html)

Tessellate (http://www.shodor.org/interactivate/activities/Tessellate)

MathSphere – Free graph paper (http://www.mathsphere.co.uk/resources/MathSphereFreeGraphPaper.html)

Paper models of polyhedral (http://www.korthalsaltes.com)

Problem solving

Mathpuzzle (http://www.mathpuzzle.com)

Puzzling world of polynedral dissections (http://www.johnrausch.com/PuzzlingWorld?contents.html)

Interactive mathematics miscellany and Puzzles (http://www.cut-the-knot.org)

Puzzles and projects (http://www.delphiforfun.org/Programs/Indices/projectsIndex.html)

10ticks daily puzzle page (http://www.10ticks.co.uk/s_dailyPuzzle.aspx)

Archimedes laboratory – teachers' resource: Improve problem solving skills (http://www.archimedes-lab.org/index_teachers.html)

Brain teasers (http://www.pedagonet.com/brain/brainers.html)

Gymnasium for Brain (http://www.gymnasiumforbrain.com)

Puzzles and games (www.thinks.com)

Miscellaneou.s

Mathematical imagery (http://www.josleys.com)