

**VOCATIONAL HIGHER SECONDARY
FIRST YEAR**

DENTAL TECHNOLOGY

Teachers' Sourcebook



**Government of Kerala
Department of Education**

2005

State Council of Educational Research & Training (SCERT)

Vidyabhavan, Poojappura, Thriuvananthapuram-12, Kerala

Prepared by:
State Council of Educational Research & Training (SCERT)
Vidyabhavan, Poojappura, Thiruvananthapuram -12
Kerala
E-mail:scertkerala@asianetindia.com

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Preface

Dear Teachers,

In Kerala, activity based and learners centred pedagogy is being introduced in the VHSE. It becomes imperative to make significant changes in the learning process as well as in the evaluation system for its successful implement.

As far as the discipline Dental Technology is concerned, its methodology of learning is genetically activity based. This unique feature of the subject itself will enthuse the teachers to pass through different activities for the transaction of the concepts.

This source book has been designed in such a way to help the teachers to convey the concepts through different but relevant process.

For the preparation of the sourcebook SCERT Kerala has drawn expertise from different field including Dental College and vocational higher secondary sectors. While going through the contents the teacher can understand that this book provides proper guidance and opportunities for planning the activities as well as the reference books needed for the transaction of the curriculum. May I hope that our concerted efforts will make an upsurge in the field of education.

With regards,

Thiruvananthapuram
25.11.2005

Dr. E.Valsala Kumar
Director
SCERT, Kerala

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PART I

GENERAL APPROACH

Introduction

The ultimate aim of education is human refinement. Education should enable the learner to formulate a positive outlook towards life and to accept a stand which suits the well being of the society and the individual as well.

The attitude and potential to 'to work' has determined the destiny, progress and cultural development of the human race. As we all are aware, the objective of education to form a society and individuals having a positive work culture. The educational process expected in and outside our formal schools should concentrate upon inculcating concepts, abilities, attitudes and values in tune with these 'work culture.' Hence vocationalised education cannot be isolated from the main stream of education. In another sense, every educational process should be vocationalised. However, due to our inability to utilise the resources wisely, scarcity of job opportunities is a severe issue of the present society. For overcoming this deep crisis, emergent techniques have to be sorted out and appropriate researches have to be seriously carried out. It is in the sense that the content and methodology of vocational Higher Secondary Education have to be approached.

The Vocational Higher Secondary course was envisaged as a part of the National Policy on Education with the noble idea of securing a job along with education. The relevance of Vocational education is very great in this age of unemployment. This education system, which ensures a job along with higher education, stands aloof from other systems of education.

A learning environment which ensures vocational aptitude, vocational training, basic life skills, competencies related to different subjects, appropriate values and attitudes and existential readiness has to be provided here.

The curriculum should be one which recognises the specific personality of the learner and should develop it in a desirable way. It should provide opportunity to imbibe novel ideas to follow a critical approach and for learning through experiences.

The competency to transform ones own resources for the betterment of the society and the individual is to be ensured in each individual. Training in the sense of equality, democratic sense, environmental consciousness and devotion to the constitution is an inseparable factor of the curriculum.

The need of a systematic curriculum is prevailing in vocational subjects. A scientifically structured curriculum incorporating the unique features peculiarity of Kerala ensuring the possibility of higher education and utilising the national and international possibilities of employment is required.

The new curriculum should be capable of assimilating the life skills, scientific temper, attitude of co-existence, leadership qualities and mental health to face the challenges of life. It should be capable of strengthening the competencies imbibed by the learners up to the tenth class.

A curriculum for selecting vocational areas according to the aptitude of the students, learning it in depth, acquire general awareness in the basic areas and to secure jobs has become the social need of the day. A learner centred, process oriented, need based vocational curriculum is envisaged.

What is learning?

- Learning is construction of knowledge and so it is a live and continuous mental process.
- Learning is a process of advancement through adding and correcting in the light of comparing the new issue with the previously learned concepts.
- Learning takes place as a part of the effort to solve problems.
- Learning takes place by assimilating bits of knowledge into ones own cognitive structure.
- Learning is not a linear process. It is a spiral process growing deeper and wider.
- Learning is an intellectual process rather than the mere memorisation of facts. Learning is a conglomeration of a variety activities like problem analysis, elucidation, critical thinking, rational thinking, finding out co-relations, prediction, arriving at conclusions, applications, grouping for other possibilities and extracting the crux. When opportunities are provided for intellectual processes learning will become effective and intellectual ability will get strengthened.

Theoretical foundations of learning

Education is the best device that can be adopted for creation of a new society. It should be democratic in content and process and should acknowledge the rights of the learner. It should also provide opportunity for better citizenship training. The concept of equality at all areas

should get recognition in theory and practice.

There should be conscious programme of action to develop nationality, humanness and love and against the encroachment of the sectarianism of caste and religion.

The learner should be able to take firm steps and deferred against the social crisis like privatisation, liberalisation, globalisation etc and against all kinds of dominations.

They should develop a discrimination to use the acquired learning as a liberative weapon.

They should be able to view education and life with the perspective of social well being.

They should get opportunity to recognise that co-operation is better than competition and that co-operation is the key to social life and culture.

A basic awareness of all the subjects needed for life essential for all students.

The remnants of perspectives formed in us during the colonial period still influence our educational philosophy. The solution to the present day perplexities of the society which approaches education on the basis of competitions and marketisation is only a comprehensive view of life.

It is high time that education was recognised on the basis of the philosophy of human education. The human approach to education has to reflect in its content, learning process and outlook. The perspective of 'learning to be ' and learning to live together as expressed by the UNESCO and the concepts of existentialist intelligence intrapersonal and interpersonal intelligence.

The basis of new approaches on curriculum, teaching- learning process are derived from the developments place in the east and west of the world.

When we begin to see the learner at the centre of the learning process, the teaching process has to be changed timely. It is the result of the rapid growth and development of Science and Technology and Pedagogy. If we want to undergo the changing process, we have to imbibe the modern hypothesis regarding learner, they have;

- Great curiosity
- Good imagination
- Numerous other qualities and interests
- Independent individuality
- Interest in free thinking and working in a fearless atmosphere.
- Have interest in enquiring and questioning.
- Ability to reach conclusions after logical thinking.
- ability for manifest and establish freely the conclusions arrived at.

- Interest for recognition in the society.
- Determination to face the interference of society and make components which is a part of social life.
-

When we consider the learning system, the domains to be stressed in education according to the modern development becomes relevant.

The *knowledge* domain consists of

- Facts
- Ideas
- Laws
- The temporary conclusions and principles used presently by scientists.

The learning is a process. The continuous procedures we undergo to reach a particular goal is process. The skills which are parts of the process to analyse the collected ideas and proofs and come to a conclusion is called *process skills*. Some important *process skills* are,

the skills;

- To observe
- To collect data and record
- To classify
- To measure and prepare charts
- To experiment
- To predict
- To recognise and control the variables
- To raise questions
- To generalise
- To form a hypothesis and check.
- To conclude
- To communicate
- To predict and infer
- To use tools.
-

Observation is the process of acquiring knowledge through the senses. It is purely objective oriented. Learning experiences which provide the opportunity to use all the senses may be used.

The process of grouping is known as ***classifying***. Starting from simple groupings of data, it can extend to the level of classification into minute sub-groups.

In addition to this, consider the skills related to *creative domain* also, they are skills:

- To visualize
- To connect facts and ideas in new ways
- To find out new and uncommon uses of objects
- To fantasize
- To dream
- To develop creative isolated thoughts
-

Creativity is an essential component of process and activities. The element of creativity is involved in finding out problems, formation of hypothesis, finding 'solutions' to problems etc. Through activity oriented learning experiences, opportunities to express creativity can be created.

Again, the following factors consisting in the *Attitudinal domain* are also important as;

- Self confidence
- Love for scientific knowledge
- Attitude to know and value history
- Respect human emotions
- Decide with reasonable present problems
- Take logical decisions regarding personal values

'Hypothesis' is a temporary conclusion drawn using insight. Based on knowledge and experiences relating to the problems the causes and solutions can be guessed.

As regards the *application domain* the important factors are the ability to:

- observe in daily life examples of ideas acquired.
- take the help of scientific process to solve the problems of daily life.
- choose a scientific life style
- connect the ideas acquired with other subjects.
- integrate the subjects with other subjects.

Some basic stands have to be taken on the new scientific knowledge about intelligence learning and teaching. When such basic concepts are accepted changes are required in the following factors.

- The vision, approach, structure and content of the curriculum.
- The vision, approach, structure and content of the textbooks.

- Role of the teacher and the learner.
- Learner atmosphere, learning materials and learning techniques.

Some scientific perspectives accepted by modern world in educational psychology are given below.

Constructivism

This approach puts forward the concept that the learner constructs knowledge. New knowledge is constructed when ideas are examined and practiced in new situations relating them with the previously acquired knowledge and experience. That is assimilated into the cognitive structure of one's knowledge. This method which gives priority to critical thinking and problem solving provides opportunity for self motivated learning.

Social Constructivism

Social constructivism is a sub section of constructivism. Knowledge is formed, spread and imbibed and it becomes relevant in a social environment. Interactive learning , group learning, co-operative participatory learning, all these are concepts put forward by social constructivism.

The main propounders of constructivism are piaget, vygotsky and Bruner.

Discovery learning and interactive learning have prime importance. Learning takes place as a part of the attempt for problem solving. The activities of a learner who confronts cognitive disequilibrium in a learning situation when he tries to overcome it leads to the renewal of cognitive structure. It is through this process construction of new knowledge and the assimilation of them that learning take place. Observation and enquiry are unavoidable factors. The learner advances towards new areas of acquisition of knowledge where he tries to compare his new findings with the existing conceptions.

Learning is a live mental process. Rather than the ability for memorisation of facts cognitive process has to be given emphasis. The process of problem analysis, elucidation, critical thinking, rational thinking, finding out co-relation, prediction, hypothesis formation, application, probing for other possibilities, extracting the crux and other processes are of critical importance in learning.

Constructivism gives greater predominance to co-operative learning. Social and cultural factors influence learning. Sharing of knowledge and experience among learners, collective enquiry, assessment and improvement, group activity and collaborative learning, by sharing responsibilities with the objective of public activity, provide opportunity for effective learning.

In learning internal motivation is more important than external motivation. The learner should have interest and initiative in learning. Learning situation should be capable of forming a sense of ownership in of the learner regarding the learning process.

Learning is not a linear process. It progresses in a spiralled way advancing deeper and wider.

Learner - His Nature and Features

The learners in standard XI has undergone a learner centered and process oriented learning experience up to X standard. He is adequately competent to select vocational subjects according to his aptitude and interest and to acquire higher education and profession as he wishes. The aspirations about future life is framed in this particular age foreseeing national and international job opportunities. Some of the peculiarities of the learner at this stage are:

- Physical, intellectual an emotional planes are intensive changes during this age and their reflections can be observed.
- Ability to enquire, discover and establish cause-effect relationship between phenomena.
- Readiness to undertake challenges.
- Capacity to shoulder leadership roles.
- Attempt to interpret oneself.
- Susceptibility to different pressures.
- Doubts, anxieties and eagerness about sex.
- Longing for social recognition.

Needs of the Learner

- To make acquaintance with a job through vocational education.
- To acquire more knowledge in the concerned area through higher education.
- To recognise and encourage the peculiar personality of the later adolescent period.
- To enable him to defend against the unfavourable circumstances without any help

Role of the Learner

- Active participant in the learning process.
- Acts as a researcher
- Sharer of information
- Sharer of responsibilities
- Collects information
- Takes leadership
- Involves in group work

- Acts as a co- participant
- Observes his environment
- Experiments and realises
- Makes interpretations and draws inferences.
-

Role of the Teacher

The teacher should;

- consider the ‘Stress and strain’ of the teenagers
- understand the socio- economic and cultural background of the students.
- promote and motivate the students to construct knowledge.
- arrange proper situations to interact in and outside of the classroom.
- guide the students by explanations, demonstrations etc.
- promote opportunity for co-operative learning and collaborative learning.
- facilitate interpersonal and intra-personal interactions.
- act as a democratic leader.
- act as a problem solver
- effectively guide the students for the selection and conduct of various continuous evaluation elements.
- continuously evaluate the progress of the learners.
- gives scaffolding/support wherever necessary.
- motivate for learning
- promote divergent thinking.
- act as a democratic group leader.
- act as a co-learner
- gives variety of learning experiences.
- be a constant student
- facilitate for reference/data collection
- have a clear understanding about the age, needs, peculiarities, abilities, nature, aptitude etc. of the learner.
- have the ability to motivate the learner in order to acquire and enrich their knowledge.
- be a guide to the learner in developing insights and creating responses on current affairs.

- be capable to lead the learner into a variety of learning methods and process based on curriculum objectives.
- be a link between school and community.
- be a good organiser, guide, friend, philosopher and co-learner.
- have an inter disciplinary approach in learning activities.
- be able to guide the learner in his/her career prospects based on his interest aptitude and ability.
- be impartial and democratic.
- provide ample experiences to attain the basic values and objectives of the curriculum.
-

New Concepts of Learning

1 Discovery Learning

The teacher has to create a motivating atmosphere for the learner to discover concepts and facts, instead of listening always. Creating occasion to progress towards discovery is preferred. Instead of telling everything before and compelling to initiate the models, situations are to be created to help the children act models as themselves.

2 Learning by discussion

That discussion leads to learning is Burner's theory. Here discussion is not opposing each other. It is a sharing on the plane of ideas. New ideas are arrived at by seeking explanations, by mutual giving and taking of ideas and by problem solving.

3 Problem solving and learning

Only when the learner feels that some thing is a problem to be solved that he takes the responsibility of learning it. It is an inborn tendency to act to solve a problem that causes cognitive disequilibrium in a particular area. It is also needed to have confidence that one is capable of doing it. The problems are to be presented in consideration of the ability and level of attainment of the learner.

4 Collaborative learning

This is the learning in which the responsibilities are distributed among the members of the group keeping common learning objectives. The common responsibility of the group will be successful only if each member discharges his duties. All the members will reach a stage of sharing the result of learning, equally through the activity with mutual understanding. The teachers who arrange collaborative learning will have to make clear the responsibilities to be discharged. This is possible through the discussion with the learners. Collaborative learning

will help to avoid the situations of one person working for the whole group.

5 Co-operative learning

This is the learning in which the learners help one another. Those who have more knowledge, experience and competency, will help others. By this exchange of resources the learners develop a plane of social system in learning also. As there are no high ups and low ones according to status among the learners they can ask the fellow students doubts and for helps without any hesitation or in hesitation Care should be taken not to lead this seeking of help to mechanical copying. It should be on the basis of actual needs. So even while encouraging this exchange of ideas among the members of the group cautions acceptance is to be observed as a convention. There should be an understanding that satisfactory responses should come from each member and that the achievement of the group will be assessed on the basis of the achievement of all the members

6 Zone of Proximal Development

Vygotsky observes that these is a stage of achievement where a learner can reach by himself and another higher zone where he can reach with the help of his teachers and peers and elders. Even though some can fulfil the learning activity by themselves there is the possibility of a higher excellence. If appropriate help is forth covering every learner can better himself.

7 Scaffolding

It is natural that the learner may not be able to complete his work if he does not get support at the proper time. The learner may require the help of the teacher in several learning activities. Here helping means to make the learner complete the activity taking responsibility by himself. The teacher has to keep in mind the objective of enabling the learner to take the responsibility and to make it successful.

8 Learning: a live mental process

Learning is a cognitive process, only a teacher who has an awareness as to what the cognitive process is alone can arrange learning situations to the learner to involve in it. Learning can be made effectively and intellectual sharpness can be improved by giving opportunity for the cognitive processes like reminding, recognising compromising , co- relating, comparing, guessing, summarising and so on. How is cognitive process considered in language learning? Take guessing and prediction for example.

- Guessing the meaning from the context.
- Guessing the content from the heading.
- Predicting the end of the story.
- Guessing the incident, story from the picture.

- Guessing the facts from indications.
- and other such activities can be given the following activities can be given for the cognitive process of summarisation.
- Preparation of blue print.
- Preparation of list.
- Preparation of flow chart.
- Epitomising in one word.
- Giving titles and so on.
- Symbols, performance of characters indications, lines of a poem, tables, pictures, concepts, actions, body language and such things can be given for interpretation. Process based language given for interpretation. Process based language learning has to give prime importance to the cognitive process.

9 Internal motivation

Internal motivation is given more importance than external motivation. The teacher has to arouse the internal motivation of the learner, A person internally motivated like this alone can immerse in learning and own its responsibility. How motivating is each of the activities is to be assessed.

10 Multiple intelligence

The Theory of Multiple Intelligence put forward by Howard Gardener has created a turning point in the field of education. The National curriculum document has recommended that the curriculum is to be designed taking into consideration of this theory.

Main factors of the intellect :

1 Verbal / linguistic Intelligence

Ability to read and write, making linguistic creations , ability to lecture competence effective a communication , all these come under this . This can be developed by engaging in language games and by teaching others.

2 Logical / mathematical Intelligence

Thinking rationally with causes and effect relation and finding out patterns and relations come under this area, finding out relations and explaining things sequential and arithmetical calculations are capable of developing this area of intelligence.

3 Visual / spatial Intelligence

In those who are able to visualise models and bringing what is in the imagination into

visual form and in philosophers, designers and sculptors this area of intelligence is developed. The activities like modelling using clay and pulp, making of art equipments, sculpture, and giving illustrations to stories can help the development of this ability.

4 Bodily Kinaesthetic Intelligence

The activities using body language come under this. This area of intelligence is more developed in dancers and actors who are able to express ideas through body movements and in experts in sports, gymnastics etc.

5 Musical Intelligence

This is an area of intelligence which is highly developed in those who are able to recognise the different elements of music in musicians and in those who can hear and enjoy songs. Playing musical instruments, initiating the songs of musicians, listening silently to the rhythms and activities like this are capable of developing this area of intelligence.

6 Interpersonal Intelligence

Those in whom this area of intelligence is developed show qualities of leadership and behave with others in a noble manner. They are capable of understanding the thought of others and carrying on activities like discussion successfully.

7 Intrapersonal Intelligence

This is the ability to understand oneself. These people can recognise their own abilities and disabilities. Writing diaries truthfully and in an analysing way and assessing the ideas and activities of others will help developing this areas of intelligence

8 Naturalistic Intelligence

A great interest in the flora and fauna of the nature, love towards fellow beings interest in spiritual and natural factors will be capable of developing this area.

9 Existential Intelligence

The ability to see and distinguish ours own existence as a part of the universe, ability to distinguish the meaning and meaninglessness of life, the ability to realise the ultimate nature of mental and physical existences, all these are the peculiarities of this faculty of intelligence.

Emotional Intelligence

The concept of emotional intelligence put forward by **Daniel Golman** was used in framing the new curriculum. The fact that one's **Emotional Quotient (E.Q)** is the greatest factor affecting success in life is now widely accepted. The teacher who aims to focus on improving the emotional intelligence of students need to concentrate on the following.

i) Ability to take decisions

Rather than imposing decision on students while planning and executing activities, the students may be allowed to take part in the decision making process. Taking decisions through open discussion in the class, inviting students suggestions on common problems etc. are habits to be cultivated.

ii) Ability to reach consensus

- When different opinions, ideas and positions arise the students may be given the responsibility to reach a consensus.
- Imagining what would be the course of action in some situations, allowing to intervene in a healthy way in problems between individuals.

iii) Problem solving

- Developing the idea that there is reason and solution to any problem.
- Training in finding reasons for problems.
- Suggesting solutions through individual or group efforts.
- Discussing social problems.
- Analysing the shortcomings in methods to solve problems.

Whether plastic can be banned within school premises can be given as a problem. Group discussion will provide reasons and solutions. Problems which can influence classroom learning and for which the learner can actively contribute solutions need to be posed.

- Self criticism, evaluation
- Ability to face problem-situation in life
- Thinking what one would do if placed in the situation of others, how one would respond to certain experiences of others - All these foster the growth of emotional intelligence.

iv) Life skills

Life skills need to be given a prominent place in education. W.H.O. has listed ten skills required for success in life.

- Self awareness
- Empathy
- Inter personal relations
- Communication

- Critical thinking
- Creative thinking
- Decision making
- Problem solving
- Copying with emotion
- Copying with stress

The new curriculum addresses these areas.

Knowing the characteristics of the learner, role of the teacher and how to use the teachers handbook help the teacher to plan and effectively implement learning activities.

Objectives of the Vocational Higher Secondary Curriculum

- To facilitate higher education while giving opportunity to enter in the field of employment.
- To develop environmental awareness, sense of national integration, tolerance and human values so as to ensure social and cultural improvement.
- To enable the learner to find on his own employment.
- To inculcate mental courage in the learner to face unfavourable situations.
- To make human resource development possible.
- To enable the learner to understand social problems and to react appropriately.
- To develop the learner to identify and develop his own competencies.
- To develop vocational aptitude, work culture and attitude in the learner so as to provide useful products and services to the society.
- To create an awareness about mental and physical health.
- To acquire awareness about different job areas and to provide backgrounds for acquiring higher level training in subjects of interest.
- To develop possibilities of higher education by creating awareness about common entrance examinations.

- To provide situation for the encouragement of creative thinking and organising training programmes in each area, creative abilities and to develop artistic talents.

Nature of Approach

The learning device is to be organised in the selected vocational subjects in such a way that adequate practical experience should be given, making use of the modern technology. The development in each area on the basis of information technology is to be brought to the learner. The work experience in the respective fields(OJT, Field trip, Production/Service training, Survey, Workshop, Exhibition, Youth festival, Physical fitness etc.) are to be adjusted suitable to the learning and evaluation process. The participation and leadership of the students in planning and execution is to be ensured through this kind of activities. Social service is to be made a part of the course.

Approach towards Vocational Higher Secondary Education

The learning methodology has to be organised so as the learning provide adequate practical thinking on the opted vocational subject utilising the new technology. The development of information technology should be made available in each sector. Work experience, OJT, Field trip production, Service cum training centre, Survey, Workshops, Exhibitions, Youth festivals, Physical fitness etc should be systematised well appropriate to learning and evaluation. Learner participation should be ensured in the planning and implementation of these activities. Social service should be a part of the course. If a learner has to change his school, he should be provided an opportunity to continue his studies in the new school. While considering criteria for admission to higher courses, grades of vocational subjects should also be given due weightage. In tune with the changes in the Vocational Higher Secondary Education changes should be ensured in the field of higher education.

The teachers have to take special care in arranging learning activities for the development of all the faculties of intelligence.

Learning activities and learning atmosphere

A proper learning atmosphere is essential for the betterment of learning activities.

They are:

- Proper physical environment
- Healthy mental atmosphere

- Suitable social atmosphere
- Active participation of PTA, Local bodies and SRG
- Reference materials and visual media equipments.
- Academic monitoring
- School Resource Group (SRG)



PARAMEDICAL APPROACH & APPROACH TO DENTAL TECHNOLOGY

A - Paramedical Approach

There is tremendous growth in medical science recently and knowledge in this field is advancing rapidly . Consequently considerable changes have occurred in diagnostic methods and patient care. Service of skilled persons in the several fields of diagnostic and patient care has become essential. As a result there is considerable increase in employment opportunities in the paramedical field. Six such paramedical course are included in the present VHSE curriculum. They are:

- 1 Domestic Nursing
- 2 Medical Laboratory Technology
- 3 ECG and audiometric Technics
- 4 Physiotherapy
- 5 Dental Technology
- 6 Maintenance and Operation of Biomedical Equipment

Aim

- To mould persons capable enough to help diagnosing and caring for patients in accordance to modern medical sciences.
- To introduce to the latest advancements in medical field
- To introduce to latest diagnostic procedures
- To regain and improve health and to serve the public

Objectives

- To familiarise with the latest technologies of modern science of medicine
- To make learners able to use new and updated diagnostic methodologies.
- To make learners capable enough to adopt the methods of recovery and improving health with a service approach.
- To make people aware of the important social issues related to health.

Learning approach

- The learning process has to be learner centred, activity oriented and enabling learners to acquire skills and efficiency.
- It should help to adequate more operational skills based on previous knowledge and experience.
- It should assimilate the up-to-date technological developments in the field of modern medical science.
- Learning approach shall enable the learner to develop multiple intelligence.

Contents

- Course details of each paramedical courses is prepared to meet the needs of the particular course. This also is intune with the objectives of each course.

Learning techniques

The various techniques that could be used in paramedical courses are as follows

Project	Assignment	Seminars
Group discussion	Practical	Experiments
Demonstration	Debate	Collection
Internet/IT	Quiz	Roleplay
Field visit	Reference books	
Discussion		

Evaluation

- Continuous and comprehensive evaluation process is envisaged.
- Evaluation methods are to be transparent, flexible, valid, reliable and practicable.
- Evaluation indicators are to be practicable.
- New curriculum should always be kept in mind while evaluating.
- Evaluation methods have to motivate learner to develop multiple intelligence.

Planning

There should be an year plan, unit plan and daily plan.

Support mechanism

- Financial management, infrastructure development inducing acquisition of equipment and maintenance of all assets could be through the support mechanism consisting of
- School PTA
- Hospitals

- Local bodies
- VHSE Directorate
- VHSEs regional office
- Voluntary organization
- NGO's
- Government support
- Staff support
- Local community
- Public library

B - Approach to Dental Technology

Introduction

The science of dentistry had undergone a vast technological advancement during past few decades. Two year course in dental technology helps student to become a competitive dental laboratory technician or a dental technician. A thorough knowledge of theory is imperative to excel in the laboratory procedures and keeping this in mind; the course is well planned and has duration of two years. A dental technician is supposed to render his duties in a dental lab where he should make artificial dentures, crowns, partial dentures; orthodontic appliances etc. .He should acquire the knowledge of basic science and skills in laboratory work. By working in a dental lab, dental technician saves the time of dentist so that the surgeon can devote his time more in clinics with his patients. Along with dentists, and dental hygienists dental technician makes a team.

Objectives

The main objective of this course is not only to train students in making prosthesis as natural as possible, but also to make them understand the importance of the job of rehabilitating the patients with an accurately made prosthesis, within the limitations of science and technology. For that student requires immense skills through theoretical and practical knowledge

The objective of this course is as follows

- To understand the basic anatomy and physiology of head and neck region
- To become aware of basic science such as physics and chemistry applicable to dental science
- To have a complete knowledge of primary and permanent dentition, its morphological features of individual tooth.
- Understanding the properties, characteristics and manipulation of different materials used in dentistry.

- To make understand the basic dental technology procedures and have and have a trial in patients under the guidance and supervision of dental surgeon.

Learning approach

W.H.O defined health as follows: “ It is the state of complete physical, mental and social well being, not merely the absence of any disease or infirmity.”

According to this dental health is absolutely necessary for achieving the state of health. The training of students should be done in such a way that he should be acceptable scientifically and socially. To obtain these aim students should have a complete knowledge in the basic science and also be capable to implement his knowledge in his skills.

Learning objectives

The entire course should be prepared in such a way that it should cater the needs of dental technician. The course materials should emphasis the various technological advancements in present era .the process of learning should be more focused towards hands on training with the basic theoretical knowledge in mind .The student should be put to face the various challenges which occur during his work. He should be in a position to manage the various situations emerging during his work.

Keeping this in mind our goal is to create a complete professional who is an authoritative in his work who can do complete justice to his profession. The dental technician should handle, as well as train others in the same field and help a dental office with fulfilling his responsibilities in a dental office.



LEARNING ACTIVITIES

Learning Activities

Various learning activities can be included like

- a. Projects
- b. Experiments
- c. Field visits
- d. Hands on courses

Projects that can be included as learning activities

- Making of edentulous upper and lower models and labeling the anatomical landmarks using different colors – aim is to identify and understand the various anatomical landmarks, its functions during the denture usage
- Anatomical carving of permanent tooth in wax — aim is to understand the morphology of all permanent tooth so that the student can identify the individual tooth using the morphological findings
- Cut and paste the pictures of the muscles of mastication and write its anatomy and its importance – aim is to provide information about the four pairs of muscles of mastication, its attachments, blood supply, nerve supply and its functions
- Draw the tabular representation of the various clinical and laboratory steps in construction of complete dentures, this provides the information of various steps involved in the construction of complete dentures.
- Write down the various salient features of the construction of various materials used in the construction of special trays (mention the various materials used in construction of special trays such as shellac base plate, heat and cold cure acrylic resin, tin foils etc. Make students present projects in chart paper the type of special tray they made along with the procedure of construction.
- Draw the picture of bite blocks ,record the salient features of upper and lower bite blocks, its parts, functions

- Try to collect the pictures of various articulators used in dentistry, according to the classification and record the steps involved in articulation procedures
- Draw the various positions of upper and lower anterior tooth during setting procedures, and write the principles involved during its setting procedures
- Draw the various positions of Upper and lower posterior tooth during setting procedures, and write the principles involved during its setting procedures
- Prepare in model the various classification of Kennedy's and its modification (Kennedy's classification of partial dentures). Special note to be taken to make understand the position of saddle in each classification
- Design a removable partial denture in a model with the assistance of the lecturer. Make understand the various parts of removable partial denture, its uses and design.
- Design a Fixed partial denture in a model. Draw the picture and understand the different parts of FPD

Experiments/ Practicals

- 1 Plaster of Paris Cube
- 2 Plaster of Paris Rectangle 1 x2 inches
- 3 Plaster of Paris Pyramid 2 x 4 inches

The aim of the above work is to get introduced to gypsum products, mainly plaster of paris, its properties, its manipulation, w:p ratio, setting time, mixing time, factors affecting setting time and mixing time and finishing and polishing.

- 4 Edentulous upper impression
- 5 Edentulous lower impression
- 6 Dentulous upper impression
- 7 Dentulous lower impression

The aim of the above is to get introduced to various impression taking techniques, selection of trays, various impression materials, manipulation of impression materials, loading of materials to the impression trays and recognizing a good impression, and the need for a good impression .

- 8 Dentulous upper model
- 9 Dentulous lower models
- 10 Edentulous upper models
- 11 Edentulous lower model

By doing the above exercises the student get the knowledge of making an ideal model, both working as well as diagnostic models. Base forming techniques such as 'Boxing' should be emphasized. Trimming of bases should also be given importance.

- 12 Shellac base plate special trays upper
- 13 Shellac base plate special trays lower
- 14 Heat cure special tray any one (upper or lower)
- 15 Cold cure special Tray one (upper or lower)

The above practicals should make the student well versed in making special trays made of shellac base plate, heat cure acrylic resin and cold cure acrylic resin. The students must be taught the manipulation techniques of shellac base plate (both dry and wet heat methods), manipulation of heat and cold cure acrylic resins, its finishing and polishing techniques.

- 16 Upper and lower bite blocks (occlusal rims)

The 2 parts of bite blocks should be discussed, and its construction methods, its uses and various dimensions also are considered.

- 17 Articulation

Various steps in articulation, both plane line articulator & Three point articulator should be taught

Setting of teeth

- 18 First set up
- 19 Second set up
- 20 Third set up
- 21 Fourth set up
- 22 Final set up

The students should rehearse and get used to the art of setting artificial teeth. Knowing the art and science of setting of tooth is the key to success of an artificial denture. The principles of setting of both anterior and posterior tooth should be taught.

- 23 Waxing up of denture
- 24 De articulation
- 25 Flasking
- 26 Dewaxing
- 27 Packing and processing of acrylic resin
- 28 De Flasking

29 Finishing and processing of denture

These are the final fabrication stages of complete dentures. Each step should be explained. The waxing up technique, flasking and Dewaxing should be explained. The various stages of polymerization reaction of acrylic resin should be shown to the students. The polishing agents and finishing techniques should be demonstrated

30 Class II setting

31 Class III setting

These are the deviations from the normal setting or class I setting. The difference in these should be explained. The molar relation is the most important factor.

Anatomic Teeth Carving

Maxillary

32 Central incisor

33 Lateral incisor

34 Canine

35 I premolar

36 II premolar

37 III molar

Mandibular

38 Central incisor

39 Lateral incisor

35 Canine

40 I premolar

41 II pre molar

42 First molar

In the above two sets of practicals the students are directed to do the anatomical size of the above tooth. To do so the student must be thorough in the morphological features of all the tooth from all sides.

(labial/ buccal, palatal/ lingual, mesial, distal, occlusal/ incisal aspect)

The carving is done in wax blocks using wax carver, the normal anatomical dimensions of the particular tooth should be reproduced.

43 Repair of denture

The above enables the student to master the technique of repairing the dentures. From

simple dislodgement of tooth from denture base to the more complicated fractures of dentures are repaired and the lost function is regained

44 Relining of Dentures

45 Rebasing of Dentures

The above two are the important maintenance techniques of complete dentures after long use. The techniques of doing relining and rebasing should be taught to students.

46 Acrylic Partial Dentures

- a Class I maxillary
- b Class II Mandibular
- c Class III Mandibular
- d Class IV Mandibular

The different classification of Kennedy's in partial denture should be done during the practical classes

47 Surveying of Model

The various types of surveyor ,its parts and different surveying tools should be explained.

48 Cast Partial Denture Designing on models

- a Class I
- b Class II modification 1
- c Class II
- d Class II modification 1

Various kennedy's classification and modification of partial denture should be designed in model using inlay wax. All components of partial denture such as saddle, major connector, minor connector, occlusal rest, rest seat, direct retainers, and indirect retainers should be incorporated while designing cast partial dentures.

49 Maxillo facial prosthesis

These are prosthesis used for various conditions and treatments

- a Obturator - mainly used in cleft palate
- b Cap splint - used in bruxism
- c Gunning splint - treatment in fracture of edentulous jaws
- d Screw gag - ankoylised jaw

The design, construction, and uses of various maxillo facial prosthesis should be discussed.

50 Fixed prosthodontics

The various types of fixed prosthodontics (FPD) should be dealt with students. Different designs should be considered, parts of FPD such as retainer, pontics and connectors should be discussed. The wax pattern of a three unit bridge should be designed in laboratory.

The following exercises should be done

- Jacket crown
- $\frac{3}{4}$ crown
- Full crown - Premolar
- Full crown – Molar
- Three unit bridge
- Anterior bridge
- Posterior bridge



CURRICULUM OBJECTIVES

Unit 1

Applied Physics

- 1 Students understand physics related to dentistry, mainly the properties of matter
- 2 To strengthen the concepts of heat, expansion by heat, transmission of heat, Boyles law & Charles law
- 3 To understand working of various small motors, its constructional features.

Unit 2

Applied Mechanics

- 1 To understand the mechanical principles involved in dentistry such as forces, laws of forces, lever, principles of lever, work, inclined plane etc.

Unit 3

Applied Chemistry

- 1 To know and understand the basic chemistry applied to dentistry like differences between physical change and chemical change, mixtures and compounds.
- 2 To understand the chemical setting, reaction, composition of various materials used in dentistry.

Unit 4

Applied Oral Anatomy

- 1 To understand the basic anatomy & physiology of head and neck region.
- 2 To know and understand the morphology of primary and permanent dentition.

Unit 5

Dental Mechanics

- 1 To understand various steps involved in construction of complete dentures
- 2 To know different partially edentulous positions and designing and fabrication of fixed and removable partial dentures
- 3 To understand the repair, relining and rebasing procedures of complete dentures
- 4 To know the principles of wire bending and construction of various clasps used in orthodontics.



SYLLABUS

Unit 1

Applied Physics

- Specific density, properties of matter including cohesion, capillarity, surface tension, viscosity, elasticity diffusion and osmosis
- Heat Temperature and its measurements, thermometers, pyrometer, general account of expansion by heat of solids, liquids and gases, Thermostats, pressure as applied to gas and hydraulic, Boyles and Charles law. Units of heat, thermal capacity and specific heat, change of state, latent heat, melting point, properties of vapour, conduction, convection and radiation, principles of electro technology as applied to dental work room,
- Small motors, constructional feature and characteristics of furnace, thermostats, spot welders, electroplating

Unit 2

Applied Mechanics

- Forces, parallelogram and Triangle law of forces, moments, couples, centre of gravity, principles of lever and cantilever ,work, energy, power friction inclined plane screws stress, strain, types of stress, bending movements strength and stiffness of material.

Unit 3

Applied Chemistry

- Distinction between physical and chemical changes, elements, difference between mixtures and compound, composition of atmosphere, burning of oxygen oxides rusting, Laws of chemical combination, acids, bases and salts
- Electrolysis, the ionic theory of solution. The electro potential series electroplating, general characteristics of metals including those used in dentistry.
- Alcohol, ether, aldehydes and ketones, fatty acids and their important derivatives, amines, simple treatment of carbohydrates, fats and proteins. Benzenes and its homologues, general characteristics of aromatic substances. Synthetic resins and plastics used in dentistry.

Unit 4

Applied Oral Anatomy

- Introduction to Human dentition
- Human dental formula and types of teeth
- Dental tissues – Enamel, Dentine & cementum
- Tooth numbering system –Palmer's & FDI system
- Functions of Teeth
- Tooth morphology – surfaces, crown morphology of primary and permanent teeth
- Occlusion and Arrangement of teeth
- Muscles of mastication - Anatomy
- Temporo-mandibular joint -Anatomy and Movements
- Mastication, Deglutition and Phonation

Unit 5

Dental Mechanics

- Steps in construction of complete denture
- Impression, preservation and boxing-in
- Cast preparation, trimming including orthodontic cast
- Cast duplication – various methods
- Construction of special trays – spacers
- Bite blocks, base plate wax rims
- Articulators, classification and uses
- Articulation, curve of spee
- Compensating curve, lateral curve
- Principles of selection of teeth
- Setting of teeth and waxing
- Flasking, dewaxing, packing, curing and deflasking
- Finishing and polishing of dentures
- Principles of partial denture, parts, design clasp, surveyor, surveying path of insertion and removal
- Principles of wire bending , wrought clasps, occlusal rests
- Fixed partial dentures, parts, types of pontics



PLANNING

In the context of the changing scenario in the field of Dental Technology, the role of lecturer is not simply teaching the syllabi. The emerging needs of education calls for a facilitator's role from teachers. The learning activities must enable the student to develop process domain and multiple intelligence skills to their maximum extent. No matter whether these skills are attained inside or outside the class room, but the teacher must bear in mind the fact that they are to be accomplished within a time frame. In order to achieve this end, the teacher may make necessary plans in terms of learning activities, the time required at various stages of learning, the time required for each unit and also the desired outcome. The plan may be hierarchically structured as

- a Yearly plan covering the entire activities for the year as whole
- b Unit plan which has to be prepared just before the start of a unit

ANNUAL PLAN

TERM	MONTH	CHAPTER	NAME OF CHAPTER	HOURS		TOTAL
				THEORY	EXERCISE/ DEMONSTRATIONS	
I	June	1	Applied Physics	25 hours	60 hours	85 hours
	July	2	Applied Mechanics	25 hours	30 hours	55 hours
	August					
II	September	3	Applied Chemistry	25 hours	60 hours	85 hours
	October	4	Applied Oral Anatomy	30 hours	80 hours	110 hours
	November					
III	December					
	January	5	Dental Mechanics	35 hours	190 hours	225 hours
	February					
	March					
	Total			140 hours	420 hours	560 hours

UNIT PLAN

Curriculum Objectives	Concepts	Process skills	Activity	Learning Aids	Evaluation
<ul style="list-style-type: none"> Students understand density related to density mainly the properties of matter 	Specific density Properties of matter Cohesion Capillarity Surface tension Viscosity Elasticity Diffusion Osmosis	Communication	Discussion Practical Assignments	Notes with discussion	Participation in discussion Understanding about ideas and concepts
<ul style="list-style-type: none"> To strengthen the concepts of heat, expansion by heat, transmission of heat, Boyles Law and Charles Law 	Temperature and measurements Expansion by heat of solids, liquids and gases Boyles Law Charles Law Unit of heat Latent heat Conduction Convection Radiation	Observation Communication Experiment	Discussion Practical Table analysis Charts	Notes with discussion Charts showing transmission of heat	Participation in discussion Understanding about ideas and concepts Prepared notes and assignments
<ul style="list-style-type: none"> To understand working of various small motors, its constructional features 	Dental lathe Furnace Thermostats Spot welders Electroplating	Observation Communication Experiment Demonstration	Charts Discussion Practical	Charts showing principles of motor, furnace, thermostat Hands on experiments with spot welders, and electroplating techniques	Understanding the concepts prepared

EVALUATION

Introduction

Evaluation is a systemic process of collecting, analyzing and interpreting evidences of student's progress and achievement both in cognitive and non cognitive areas of learning for the purpose of taking a variety of decisions.

What are the features of evaluation in a child centered and activity based curriculum which gives importance to both process and product?

Evaluation should be comprehensive

- Learning is an active mental process
- Development of all the process skills are to be evaluated
- Scientific knowledge, facts, concepts, attitude and interest are to be evaluated

Evaluation should be continuous process

- Child progress through different learning experiences. Learning progress should be evaluated from time to time. Learner must develop a convincing understanding of new information, developed through learning experience. They are to be given all help for this. The students may make use of the help of the teacher to solve difficulties in learning. Thus opportunities for continuous improvement are provided to the teacher and the student.

Evaluation should be an essential component of learning process

- Evaluation is a process which should proceed along with learning. The aims of evaluation cannot be achieved only through term end or annual evaluation of students. Continuous evaluation is important here. The activities that are carried out in a class room are meant for developing different ablates in children. The pupil should achieve both in scholastic and co scholastic areas. In all these situations the pupil should be continuously evaluated.

Self evaluation and peer evaluation

- Various strategies can be adopted for evaluation. Self evaluation and mental evaluation of pupils are also found to be effective.

Types of Evaluation

1 Terminal Evaluation (T.E)

Terminal evaluation should be in written form. The intention of the test must not be confined to memory test alone. It is an important tool for evaluating the facts, concepts and ideas gained by the learner. While preparing questions for the terminal evaluation more emphasis should be given to the level of application, analysis, synthesis and evaluation than knowledge and understanding. The questions should be framed in such a way that the students are able to apply their various mental processes such as

- Retrieve/ recollects/ retells information
- Readily makes connections to new information based on past experiences and formulates initial ideas/ concepts
- Detects similarities and differences
- Classifies/ categories/ organizes information appropriately
- Translates/ transfers knowledge or understanding and applies them in new situations.
- Establishes cause-effect relationships
- Makes connections/relates prior knowledge to new information/ applies reasoning and draw inferences
- Communicates knowledge/ understanding through different media
- Imagines/ fantasies/ designs/ predicts based on received information
- Judges/ appraises/ evaluates the merits or demerits of an idea/ develops own solutions to a problem

2 Continuous Evaluation (C.E)

Traditionally we were following only single evaluation tool which measures the intellectual capacity of the learner. To eliminate the limitations of this method we are forced to evaluate the multi-dimensional competencies of the learner with regard to the practicability and nature of the subject. The following tools are advised for continuous evaluation.

- I Seminar
- II Assignment
- III Class test
- IV Practical
- V Project
- VI Collection

How to evaluate continuous evaluation of items

Grading indicators for each CE item

I	Lab Work	Score
1	Preparation for the work	4/3/2/1
2	Skill in handling materials	4/3/2/1
3	Accuracy and perfection	4/3/2/1
4	Application of theory	4/3/2/1
5	Recording of the work and timely submission	4/3/2/1
II	Seminar	Score
1	Ability to plan & organize (time,topics, source of data, method of presentation)	4/3/2/1
2	Skill in collection of data (relevance, authenticity, variety of sources)	4/3/2/1
3	Awareness of content (presentation of aper, participation in discussion, ability to substantiate his own ideas and views)	4/3/2/1
4	Ability to prepare report (sequence in the presentation of concepts, authenticity & clarity of ideas, views, concepts)	4/3/2/1
5	Skills in communication (paper presentation, participation in discussion)	4/3/2/1
III	Assignment	Score
1	Awareness of the content	4/3/2/1
2	Comprehensiveness of the content	4/3/2/1
3	Systematic and sequential arrangement	4/3/2/1
4	Own observations/ suggestions/ views	4/3/2/1
5	Timely submission	4/3/2/1

IV Class Test

For the public examination the best score out of two term end evaluations (TE) should be considered, for the score for continuous evaluation item is class test. But in a term, class test may be conducted for diagnostic purpose and the average score of them should be taken and recorded in evaluation profile under the continuous evaluation item. The features of a class test are as follows.

- It is a tool used to find out and to solve the learning problems faced by students
- It may be used as a tool to collect feedback from students during learning process
- Class test need not be written test. It can also be organized as performance test.
- After completing a unit, it can be in the form of a unit test
- It may not be a test including more than one unit
- Attendance of all class may be ensured during class test
- Class test may be carried out by teacher handling the subject
- Questions may be prepared in school by following the directions of school examination board.
- Class test may be informed in advance. No time table or printed questions is required
- Questions should be suitable for subject approach
- Should be completed in one period
- Arrange more activities to solve the problems identified through class test after discussing with students.
- Discussion of value points with students and peer evaluation and self evaluation may be used

Class Test

Subject : Dental Technology			Item: Class Test		
Sl. No	Name	Marks		Average	Score
		I Term	II Term		
1					
2					

V Project(i) *Ability to plan*

4/3/2/1

- Ability to select suitable learning method for solving the problem
- Ability to develop suitable tools
- Ability to plan the duration of study and various activities to be carried out in each stage.

(ii) *Ability to collect data* 4/3/2/1

- Ability to collect sufficient and relevant data
- Ability to classify and arrange data for analysis
- Reliability and authenticity of collected data

(iii) *Ability to analyze the data and arrive at conclusions /inferences* 4/3/2/1

- Ability to analyze data
- Ability to draw inference based on analysis of data
- Ability to give suitable suggestions based on the inference

(iv) *Ability to prepare the project report* 4/3/2/1

- Ability to prepare the project report reflecting the process skills
- Communicability of the report
- Authenticity of the report
- Relation with project diary
- Time bound completion

(v) *Viva-voce* 4/3/2/1

- Ability to analyse the data
- Ability to justify the inference
- Ability to explain the strategies and methods adopted and communicate the findings

Recording of Grades

Project

Subject : Dental Technology		Item: Project					Total Score (20)
Sl. No	Name	Grading Indicators					
		I (4)	II (4)	III (4)	IV (4)	V (4)	
1	Anand	2	3	4	4	4	17
2	Shibu	4	3	4	4	4	19

Continuous Evaluation

Evaluation of a student should be carried out through out the course. To have a continuous evaluation certain tasks can be given to students such as *projects, seminars, assignments group discussion, debate, experiments* etc. Technical assistance should be given to the needy.

I Project

Project is one of the suitable methods of instruction for dental technology. It is a method of self instruction using the method of science and useful in the development of a number of process skills and hence it is essential to use projects in science education right from primary stage to higher level of education.

What is a project?

When a problem is fact, data regarding the problem is collected. The collected information is summarized and analyzed. The conclusions that are obtained from analysis are used to solve the problem – these steps reflect the essentials of a project. By doing projects students are given the opportunity to train in the method of science. In doing so the student acquires problem so the student acquires problem solving ability which helps to tide over problematic situations in life and progress in life.

Projects help to develop scientific temper, scientific attitude and interest in learning science and to ensure active participation of the student in learning activities.

Stages of project

1 Feeling the problem

The project topic should not be arbitrarily created. It should reflect a felt problem in learning situations and which requires a solution to proceed further.

Project topics arise when discussions relating to lessons are held in the class It is important that the student has an internal urge to find out a solution to the particular problem. When topic is presented the teacher must ensure this.

2 Defining the aim

If the student is to tackle the problem in a way suitable to his/ her abilities, thinking skills and available facilities, the aim of the project need to be defined precisely. To state the aims of the project simply and clearly, the student needs the help of the teacher.

3 Planning

a Hypothesizing

Drawing temporary conclusions on the basis of information available at the time is known as hypothesizing.

b Methods and instruments

Study methods and instruments are to be selected based on aims of the project and the hypothesis drawn. The nature of the topic, instruments used and the scientific approach followed should be correlated. Some methods and instruments are listed below.

▪ **Survey**

Once survey method is selected, where, when and how to conduct the survey must be decided. What will be the sample and who are to be contacted for data will also be considered? Questionnaires and survey forms are to be drawn up. During the planning phase all these are to be discussed in detail. Teacher must interact with the students, give suggestions and ensure that the instructions are suitable and effective.

▪ **Experimentation**

When experimental method is to be used, it must be considered whether necessary equipment is available. If not can these be improvised? How can materials and instruments be made available? These questions must be considered.

c Tabulation of data

- What information is to be collected?
- What method can be used for collecting information?
- When should observations be made?
- How to tabulate data?
- Are pictures, samples, and working models required?
- Are checklists, rating scales and score cards needed?
- The method of analysis should be decided in advance. Keeping the schedules, honest collection of data, accuracy of data and precision are important.

d Analysis

The collected and tabulated data can be analyzed to examine the validity of the hypothesis. The collected data need to be classified and compared. Comparison with standard information may also be required.

Graphics and similar representation will make the analysis easier.

e Conclusion

Based on similarities, differences and relationship evident from analysis of data, the validity of hypothesis may be examined. Those found invalid are rejected and others are accepted as conclusions.

4 Execution of the project

An outline of the project based on the components above may be drawn up. The project activities may be carried out according to this plan with necessary modifications at the appropriate stages. Difficulties faced during execution of the project data obtained and information's collected, are to be entered in the 'Project Diary'. This all be helpful during report working.

Visits made during the conduct of the project, experiments, arranging equipment, recording data and analysis should be supervised by the teacher. Teacher must take care to conduct discussions with students frequently to evaluate the progress of the project.

Application :-The suggestions that arise from the project must be used for problem solving where applicable.

5 Project Report

A model for project report is given below. Report is to be prepared by the students themselves. The structure of the report should be finalised through discussion with the students. It must be ensured that it is not too complex and hinders activities.

- The cover page may show title of the project, name of the student/members of the group, and school address.

The report may be contain

- a Title
- b Introduction
- c Hypothesis/Aims
- d Methods of study
- e Collected data
- f Analysis and Conclusions
- g Suggestions (if any)
- h Reference (if any)
- i Appendix (questionnaire, observation, schedule, checklist etc.)

The project diary should be made use of to prepare the project report. The aims and method of study of the project would be recorded in the project diary during the time of doing the project. The credibility of the project and data can be established with the help of project diary. Teacher may given necessary directions to prepare the project diary. At frequent intervals the teacher must check whether the recording is made in the diary.

- A project diary should be maintained by the learner which is considered as the product of the authenticity of the work done.

- It should contain all the activities for the learner in detail.
- Information must be recorded in an ordered way and analyzed objectively to draw appropriate conclusions. Collected information must be shared with others. The learning progress is complete only when the relevant information is summarized efficiently.

The project method helps to train the students in the method of science to familiarize them with self study habits and to find solutions for local problems. We must take care to cultivate this as an important method of study in our schools.

II Seminar

Reporting is core component of learning science. In seminar, data relating to a specific topic is collected, analyzed and presented as paper for the benefit of others. It helps the learner to improve his/her communication skills and provides opportunities for collection of secondary data and for drawing conclusions. It is useful in cultivating interests and attitude in science topics and in personality development. Topics chosen for seminars may be contemporary and should have social relevance.

Organization of seminar

- Topic presentation
- Finding out sub topics or different areas
- Group information
- Assigning sub topics to different groups
- Discussion by each group on the assigned information can be gathered from area or sub-topic (books, magazines, internet institutions, place and person)
- Organizing ideas
- Paper writing
- Seeking the opinion of the teacher.
- Presentation
- Discussion
- Summarizing

The teacher may provide reference materials and give directions at all stages.

- Paper writing
- The paper may include new information gained through data collection, conclusions and findings.
- The information collected by all the member may be included.
- Tables, charts, books and other source materials may be included.

Teacher may examine the paper at different stages and provide guidelines. The activities and participation of each student in the group may be assessed.

Paper Presentation

- Teacher may function as the moderator during the initial states, but it is better to assign this role to students themselves.
- The paper presented must be written out completely.
- All the group members must be present in the class during presentation and must actively participate in the discussion after presentation by the leader.
- Questions from the audience are to be answered by group members taking turns.
- Teacher may intervene when necessary to provide instructions and help.
- When sub topics are presented, after all the presentations are over general discussion may be held. Teacher may summarise the discussion.
- A summarised version of the report may be recorded in the science diary.
- Seminar papers and reports may be kept in the information corner.

III Discussion

Discussion is the natural part of the transaction between teacher and student. In the process approach it has a significant role. Discussions are essential for the student to share new findings, ideas and conclusions at each stage of learning with fellow students and teachers and assess progress.

Group discussion is an ideal method to inculcate social situation, co-operation, democratic attitude, friendliness, low open mindedness and compromising attitude which are the ultimate aims of education. It helps the development of communication skill, hypothesis formulation, designing of experiments and analytical skills. By sharing ones ideas with others and by listening to other people's ideas, scientific literacy is also strengthened.

In a student centered classroom, the following points must be borne in mind while conducting a discussion.

Discussion points may be provided to guide the progress of the discussion.

This will help the students to reach the proper conclusion. Discussion points may be in the form of questions or statements.

- During group discussion the teacher may observe each group and if needed help them to channel the discussion towards the common objective.
- All students may be given opportunity to take part and express their ideas.
- It must be ensured that time limits are observed.

- The conclusion reached may be entered by each student in the science diary and a group representative must present these during consolidation.
- The teacher may correct or add to the conclusions and ensure that all the relevant ideas have been covered.
- Students may be instructed to enter the consolidated ideas in the zoology diary.

IV Debate

Debate is an important method of learning science, social constructivist theories consider debate as an ideal method of learning.

After presenting a controversial topic, arguments in favors and against are put forward and a detailed analysis of facts is done by both sides in a debate.

Relevance of Debate

- To develop the skill of presenting ones views logically and argue convincingly.
- To develop the ability to compare others views with ones own view and to understand relevant aspects of ideas of others.
- To develop leadership quality, democratic attitude, several consciousness, unity, and communications skills.

Conducting a debate

The selection of the debate topic must be done very carefully. A controversial topic (one which can be viewed from two different standpoints) is suitable for debate. Both viewpoints must help in cultivating certain positive attitudes in students.

The teacher must not take a stand favouring on group. An objective approach is to be maintained while presenting the topic.

The processes in the debate are;

- Topic presentation
- Preliminary discussion - students are grouped into two.
- The two groups discuss the arguments they are going to present.
- Responsibilities assigned for presenting different viewpoints and arguments.
- Either the teacher or a student functions as the moderator.
- Each group presents their arguments.
- Moderator presents an analysis of the ideas and consolidating the points. Moderator may present the consolidation in tune with the methods of science. The consolidated information is recorded in the Dental Technology diary.

Responsibilities of a moderator

- Introductory presentation
- Guiding the discussion
- Ensuring that the discussions are on right track
- Ensuring the limits
- Consolidation of arguments

A model for planning

Stage 1 Period

- Introductory presentation of the topic
- Grouping of students
- Group discussion
- Collection of information within groups
- Assigning responsibilities
- Fixing date and time of debate

Stage 2 Debate

- Seating arguments
- Introductory remarks
- Presentation of arguments from two sides
- Discussion
- Consolidation

The moderator's main responsibility is consolidation. It must be un biased, analytical and efficient .

Stage 3

- Preparing report on the debate
- Entering the details of the debate in Dental technology diary.

V Experiments

An experiment familiarizes the students with the method of science and develops the process skills. It serves the following aims

- Development of process skills
- Ability to handle equipments
- Development of interest in science , sense of responsibility, aptitude and attitude
- Providing direct experience

Planning

- Must be related to text unit
- Introductory discussions must help the need and aims of experiments. Students are instructed on the manner of recording and safe handling of equipments and materials
- Experiments must be suitable to the age and maturity level of students
- Must be interesting to students

Points to note

- If only limited number of equipments is available students may work in groups
- Each group must be given appropriate instruction
- Experiments must proceed according to instructions given
- It must be ensured that dimensions are accurate
- Time limit must be maintained

Evaluation

- Accuracy & perfection in experiments, discipline, scientific attitude, use of process skills
- Handling of equipments in proper way
- Manipulation of dental materials

Teachers must be present during all stages of the experiment to provide necessary instructions and guidance.

VI Outdoor learning

Direct observation is essential for the development of ideas in a process based learning. It may be difficult to provide opportunities for this in all class rooms. Hence learning science with in the class room is not advisable. Outdoor learning provides experience in the natural settings that cannot be provided through a classroom situation or laboratory.

Relevance

- Learning becomes environment based
- Direct learning experiences are gained
- Learning is linked to real life and practical situations
- Helps to where experiences with people who apply science in real situations
- Develops values attitudes and interests
- Helps to develop personal qualities
- Helps to evaluate the development of emotional domine

On the basis of method, conduct and duration outdoor learning can be of two types

1. Field trip
2. Study tour

1. Field trip

This is a method of study which links learning activities with school surroundings with definite aims. If needed, the services of local experts and parents may be sought. Proper planning is essential for the success of field trips as in the case of any other learning activity. As a part of project activities, field trip or study tour may have to be carried out.

2. Study tour

Study tour will have more than one aim. It requires more time and consequently extensive planning and preparations have to be done. Before the study tour the student may be prepared and assigned responsibilities to be shared between groups. A very clear understanding of travel scholastic and understanding of equipment is needed. To understand concepts relating to biodiversity, field trips is an ideal activity

Planning

- Lesson unit – objectives intended
- What are to be observed, to be enquired, to be collected?
- How to record?
- What services of local community are needed?
- Place, travel facilities, expected expenses, materials needed

During field trip

- It must be ensured that all activities proceed according to plan. The teacher may intervene and provide adequate instructions.
- Teacher may check whether the observations are recorded adequately whenever they are made
- Report of the field trip must be entered in dental technology diary

After the field trip

- The information collected may be discussed in the class room
- The information consolidated by teacher after discussion may be entered in dental technology diary

Report must give emphasis to activities conducted, findings and ideas gained through field trip rather than to travel in detail.

Evaluation

- Recording in the diary and report
- Participation of students
- Sharing of experiences and explanations given on questions raised
- Punctuality

VII Dental Technology Library

Materials that facilitate dental technology learning may be collected for the dental technology library. Broachers, books , CD Rom may be brought as per instruction. A library committee may be constituted under the leadership of the teacher in charge of library

Aims

- To develop reference skills in students
- To inculcate a positive attitude towards reading
- Develop deep knowledge in difficult subjects
- Collect date from secondary sources
- Familiarize the students with the life and discoveries of scientists

Activities

- The books may be kept in corner of the class room or in library itself according to availability of space.
- Books can be distributed to both teachers and students.
- Student committee may be formed to manage library affairs.
- With the help pf students and local community, science books, journals , pictures may be collected .
- Collection made by students can be acquired for the library.

The students may be asked to write short notes on books they read

Evaluation

- Book review prepared by students
- Number and variety of books read
- Discipline, punctuality
- Interest in reading

VII Multi Media Room

To provide appropriate learning experiences in the new curriculum, advances in science

and technology may be use of setting up a multimedia room in each school would help in this aim. The multimedia room may have the following equipment

- **Over Head Projector (OHP)**

It is a very useful instrument in audiovisual aid. Transparency sheets showing written/ printed material can be projected to the screen

The following can be used to record on transparency

- OHP marker pen
- Indian ink
- Hecto carbon paper
- Photocopy on transparency
- Laser print on transparency

When transparency sheets are prepared the following points may be kept in mind

- The main ideas relating to topic may be presented under serial number
- Use big font size, write clearly
- Use colors

Computer

The computer is a medium which can store enormous data and help in analyzing and presenting data in many forms. 3D pictures, movements and sounds can be recorded and store in computer.

Making use of computer

- Slides and animation can be prepared on lesson units
- Print out copies of the material prepared can be used for group work
- Internet
- Liquid Crystal Display (LCD)

VIII Assignments

Assignments are learning activates helping to achieve the curriculum objectives and also lead the student from present level to a higher level of learning. Assignments may be of the type writings, drawings, construction of models and a note on methods used in construction may also be submitted.

The discussions and planning may be carried out in class room to complete the assignments in time. Clarifications may be given about sources .Teacher may provide the sources if needed.

Assignment

Subject : Dental Technology		Item: Assignment					Total Score (20)
Sl. No	Name	Grading Indicators					
		I (4)	II (4)	III (4)	IV (4)	V (4)	
1	Anand	2	3	4	4	4	17
2	Shibu	4	3	4	4	4	19

- I Ability of content
- II Comprehensiveness of the content
- III Systematic and sequential arrangement
- IV Own observation/ suggestions/ views/ judgement/ evaluation
- V Timely submission

CE Score - Dental Technology (Consolidated Statement)

Sl. No	Name	CE Items			Total (60)	Total CE Out of 20
		1 Project (20)	2 Assignment (20)	3 Class Test (20)		
1	Anand	18	17	19	54	18
2	Shibu	20	19	18	57	19

CE Score - Class XI - Dental Technology

Sl. No	Name	Subjects of CE Scores							
		English (20)	GFC (20)	Dental Technology (20)	Physics (20)	Chemistry (20)	Biology (20)	-	-
1									
2									
3									
4									
Date		Signature							

Terminal Evaluation

Terminal evaluation can be done in the respective terms by testing the practical and theoretical knowledge.

Practical Evaluation

The practical skills of a student can be evaluated during the *practical class, practical terminal exams* as well as in *on job trainings, field visits, hands on courses etc.*

The following aspects are identified for P.E

- Total - 150 marks
- Record - 15%
- Viva - 10%
- Experiments procedure to practical - 10%
- Handling of equipments - 10%
- Observation, Tabulation - 20%
- Interpretation, Inference - 10%
- Result - 10%
- Identification - 15%

Vocational Competency Evaluation (VCE)

Being a vocational course a system that judiciously evaluate the acquired value addition and consequent capacity building in the selected vocational subject is highly essential. As the other evaluation components like CE, TE and PE cannot assess the vocational competencies and professional skills acquired by the students, an Internship Evaluation (IE) component has been introduced to meet this requirement.

Internship evaluation should be done based on the following components.

1 Regularity and punctuality

A regular attendance and habit of time bound completion of task is very essential for the effective training

2 Field visit/ survey

The experience gained through field visit/ survey, increases the level of intrinsic motivation and positive attitude towards the vocational subject and thereby the student becomes a skilled personnel.

3 OJT/ Simulated experiment

Performance of short term industrial training, performance in production/ training centre/ testing stations/ laboratories outside the campus

Simulated experiments enable the students to practice the acquired skills in the real situation and thereby increasing self confidence and self reliance.

Regularity and punctuality can be evaluated by 5 point grading system

		1	2	3	4	5
1	Regularity	Never regular	Often regular	Usually regular	Most of the time regular	Always regular
2	Punctuality	Never Punctual	Often Punctual	Usually Punctual	Most of the time punctual	Always punctual

Regularity and punctuality can be assessed by using attendance of the student and time bound completion of tasks.

Indicators for field visit

4/3/2/1

- Attitude of readiness towards the task
- Capacity for observation
- Data collection

- Application of ideas
- Documentation / Recording

Indicators for survey

4/3/2/1

- Planning
- Data collection
- Consolidation of data and analysis
- Drawing inference
- Reporting

III OJT/ Simulated Experiment

- involvement/ participation
- skills in doing work/ communication skill
- time bound action
- capacity for observation and analysis of innovation
- documentation, recording and display

Performance in outside testing laboratories

- ability for planning and organisation
- punctuality and turn out
- handling
- data collection and inference
- tabulation and result

Performance - production cum training centre

- mastery of vocational subject
- managerial capacity
- promoting self confidence
- innovative approach
- promoting self reliance

Vocational Competency Evaluation(VCE) Items

Items	Score
Regularity & Punctuality	10
Field visit/survey (any one)	20
OJT/simulated experiment Performance - PTC (any one)	20
Total	50

A minimum of 80% attendance is required for promotion to the second year. Those who have shortage of attendance should repeat first year. Those who have more than 80% attendance but failed to achieve 30% of internship evaluation will be promoted to the second year. He has to improve the component in which he performed poorly. He has to attain the minimum by improving the particular component to get eligible for appearing second year public examination.



Government of Kerala

Board of Vocational Higher Secondary Examinations

Reg: No.

Thiruvananthapuram

Dated : _ _ _ _ _

Evaluation Sheet

Sri./Smt. _____ is awarded
Scores/grade as detailed below in the First Year Vocational Higher Secondary
Examination held in _____

Name of School : _____ Admission No : _____

Name of Vocational Course : _____

Subject	Score Obtained					Positional Grade	Grade in words
	CE 20	TE 80	PE 150	IE 50	Total		
Part- I							
English			—	—			
General Foundation Course			—	—			
Part- II Vocational Subjects							
Vocational Theory			—	—			
Vocational Practical	—	—		—			
Vocational Competency	—	—	—				
Part- III Optional Subjects							
	20	60	20				
Physics				—			
Chemistry				—			
	20	80					
Biology			—	—			

CE- Continuous Evaluation, TE- Term End Evaluation, PE- Practical Evaluation,
IE- Internship Evaluation.

Grades A+ 90% and Above - Outstanding	A 80- 89% - Excellent.
B+ 70 - 79% - Very Good	B 60- 69% - Good
C+ 50 - 59% - Above Average	C 40- 49% - Average
D+ 30 - 39% - Marginal	D 20- 29% - Need improvement
E Below 20% - Need improvement	

Marks Entered by _____

Marks checked by _____

Supdt/ T. O _____

SECRETARY

PART II

1. APPLIED PHYSICS

Introduction

Study of dentistry involves art and science. The application of science in a skillful way is the secret behind a successful dental technician. The application of physics is essential in understanding the basic principle involved in denture fabrication and subsequent events. Discussion, debate, assignments should be the main part of learning activities which should be followed in this chapter.

The learning activities should be planned and provide such learning experiences to students so as to develop creativity, process skills through experimentation and preparing charts of related ideas and concepts.

Curriculum Objectives

- Students understand physics related to dentistry, mainly the properties of matter
- To strengthen the concepts of heat, expansion by heat, transmission of heat, Boyles law & Charles law
- To understand working of various small motors, its constructional features.

Syllabus

- Specific density, properties of matter including cohesion, capillarity, surface tension, viscosity, elasticity diffusion and osmosis
- Heat Temperature and its measurements, thermometers, pyrometer, general account of expansion by heat of solids, liquids and gases, Thermostats, pressure as applied to gas and hydraulic, Boyles and Charles law. Units of heat, thermal capacity and specific heat, change of state, latent heat, melting point, properties of vapour, conduction, convection and radiation, principles of electro technology as applied to dental work room,
- Small motors, constructional feature and characteristics of furnace, thermostats, spot welders, electroplating

Exercise/ Demonstrations 60 Hrs

- Balance – weighing correct to a milligram
- Determination of sp.gravity by Archimedes principle
- Determination of surface tension by capillary rise
- Determination of sp. Heat of solids & liquids by mixture

Towards the content

The students have already learned the basic concepts of physics regarding the properties of matter, temperature and its measurements and concepts and principles of small motors in their lower classes. As an introduction to this chapter it would have general discussions on application of physics related to dentistry.

1.1 Properties of Matter

Suggested activity:- Discussion, Practical, Assignments

This portion is covered through discussion, experimentations, and assignments.

Points for Discussion

- What is specific density?
- What is density and relative density?
- What is surface tension and surface energy special emphasis on denture retention?
- What is viscosity?
- What is diffusion and osmosis?
- What is elasticity?

1.2 Heat

Suggested activity:- Discussions, experiments, assignments

Points for Discussion

- How will you measure temperature?
- How solids, liquids and gases expand on application of heat?
- What is the principle of thermostat?
- What is Charles's law and Boyle's law?
- What are the units of heat?
- What is latent heat?
- What are the ways of transmission of heat?

1.3 Dental Motors/ Spot welders/ Electroplating

Suggested Activity :- Discussions, Assignments, Demonstrations

Points for Discussion

- Principles behind Thermostat
- What is spot welding?
- What is electroplating?
- How electroplating procedure can be useful in dentistry?

Consolidation

- Matter and its properties like cohesion, adhesion, capillarity, elasticity, viscosity
- Heat, units of heat thermostat ,conduction of heat, temperature and its measurements
- Functions of motor, spot welder, electro plating, electro polishing



UNIT PLAN - UNIT 1 APPLIED PHYSICS

Curriculum Objectives	Concepts	Process skills	Activity	Learning Aids	Evaluation
<ul style="list-style-type: none"> Students understand Physics related to dentistry mainly the properties of matter 	Specific density Properties of matter Cohesion Capillarity Surface tension Viscosity Elasticity Diffusion Osmosis	Communication	Discussion Practical Assignments	Notes with discussion	Participation in discussion Understanding about ideas and concepts
<ul style="list-style-type: none"> To strengthen the concepts of heat, expansion by heat, transmission of heat, Boyles Law and Charles Law 	Temperature and measurements Expansion by heat of solids, liquids and gases Boyles Law Charles Law Unit of heat Latent heat Conduction Convection Radiation	Observation Communication Experiment	Discussion Practical Table analysis Charts	Notes with discussion Charts showing transmission of heat	Participation in discussion Understanding about ideas and concepts Prepared notes and assignments
<ul style="list-style-type: none"> To understand working of various small motors, its constructional features 	Dental lathe Furnace Thermostats Spot welders Electroplating	Observation Communication Experiment Demonstration	Charts Discussion Practical	Charts showing principles of motor, furnace, thermostat Hands on experiments with spot welders, and electroplating techniques	Understanding the concepts prepared

2. APPLIED MECHANICS

Introduction

Knowledge of some mechanical principles is very important for understanding some topics related to dentistry. The students must learn these principles to overcome the difficulties during and after denture constructions. These can be learned through discussions experiments, assignments.

Curriculum Objectives

- To understand the mechanical principles involved in dentistry such as forces, laws of forces, lever, principles of lever, work, inclined plane etc.

Syllabus

- Forces, parallelogram and Triangle law of forces, moments, couples, centre of gravity, principles of lever and cantilever ,work, energy, power friction inclined plane screws stress, strain, types of stress, bending movements strength and stiffness of material.

Exercise/ Demonstrations

- Verification of the parallelogram and Triangle law of forces
- Inclined plane, determination of mechanical advantage
- Determination of Young's modulus by bending of beams

Points for Discussion

- Describe forces?
- Parallelogram law of forces
- Triangle law of forces
- What is couple?
- Centre of gravity
- Principles of lever

- Work, energy
- Power, friction
- Inclined plane
- Screws - its principle, pitch of screw
- Stress, types of stress and strain - compressive, tensile, shear

Consolidation

- Forces and principles of lever
- Types of stress - compressive stress and tensile stress



UNIT PLAN - UNIT 2

APPLIED MECHANICS

Curriculum Objectives	Concepts	Process skills	Activity	Learning Aids	Evaluation
<ul style="list-style-type: none"> To understand the mechanical principles involved in dentistry such as forces, principles of lever, work inclined plane 	Forces Parallelogram law of forces Triangle law of forces Couples Centre of gravity Principles of lever Work, energy Power, friction Inclined plane Screw Stress and strain	Observation Communication Data interpreting Experiments	Discussion Charts Table Analysis Projects	Materials needed for project Charts showing different law of forces Charts showing stress and strain	Prepared charts Project participation Understanding concepts and ideas

3. APPLIED CHEMISTRY

Introduction

In Dentistry lot of materials have been used for different purpose. This includes, gypsum products, resins, metals acids, alloys etc .the knowledge of the chemical composition, reaction between two substances, effect of oxygen on metals are very important for the student. This can be achieved by discussions, experiments, charts etc.

Curriculum objectives

- To know and understand the basic chemistry applied to dentistry like differences between physical change and chemical change, mixtures and compounds.
- To understand the chemical setting, reaction, composition of various materials used in dentistry.

Syllabus

- Distinction between physical and chemical changes, elements, difference between mixtures and compound, composition of atmosphere, burning of oxygen oxides rusting, Laws of chemical combination, acids, bases and salts
- Electrolysis, the ionic theory of solution. The electro potential series electroplating, general characteristics of metals including those used in dentistry.
- Alcohol, ether, aldehydes and ketones, fatty acids and their important derivatives, amines, simple treatment of carbohydrates, fats and proteins. Benzenes and its homologues, general characteristics of aromatic substances. Synthetic resins and plastics used in dentistry.

Exercise / Demonstrations

Tests for Acids and Alkalies

- Acids base titration – Neutralization of acids with Alkalies. Titration of N/10 NaOH with N/10 H_2SO_4 phenolphthalein as indicator

- Total nitrogen determination in organic nitrogenous materials by Kjaldal digestion and distillation
- Total Nitrogen determination in In organic solutions by direct distillation with Mg
- Determination of phosphorus in in organic materials by precipitation
- Determination of potassium in aqueous solution by per chlorate method
- Electrolytic deposition of metals

Suggested activity:- discussion, experiments, assignments

Points for Discussion

- Differences between physical change and chemical change
- Differences between mixture and compound
- What is element
- Composition of atmosphere
- Oxygen and its properties
- Laws of chemical composition
- Acids, bases and salts
- Metals and its general properties
- Electropotential series
- Electroplating, its importance in dentistry
- Alcohol, ether, aldehydes, fatty acids, carbohydrates, fats, proteins.
- Benzene and its homologues
- Synthetic resins used in dentistry, composition, manipulation, polymerization reaction.

Consolidation

- Differences between physical and chemical change, mixtures and compound
- Law of chemical combination , oxygen effects of oxygen on metals
- Acids, bases & salts
- Electrolysis and electroplating and its implication in dentistry
- Synthetic resins, special emphasis on resins used in dentistry



UNIT PLAN - UNIT 3 APPLIED CHEMISTRY

Curriculum Objectives	Concepts	Process skills	Activity	Learning Aids	Evaluation
<ul style="list-style-type: none"> To know and understand the basic chemistry applied to dentistry like differences between physical change and chemical change, mixtures and compounds 	Distinction between physical change and chemical change. Mixtures and compounds Composition of atmosphere Oxygen, oxides Laws of chemical combination Valences, chemical symbols Acids and bases	Observation Communication Experiments	Discussion Assignments Project Preparing charts and tables	Notes with discussion points Charts showing differences between physical and chemical change Charts showing differences between mixtures and compounds Periodic Table	Participation in discussion Prepared notes and assignments Project participation
<ul style="list-style-type: none"> To understand the chemical setting, reaction, composition of various materials used in dentistry 	Alcohol Ethers Ketones Fatty acids Synthetic resins used in dentistry	Observation Communication Experiments	Preparing charts and tables Discussion Projects Table analysis	Charts showing chemical composition of various things	Participation in discussion Prepared charts and tables

4. APPLIED ORAL ANATOMY AND PHYSIOLOGY

Introduction

The knowledge of basic anatomy of head and neck region, mainly of mouth and its surrounding tissues is essential for the study of dental technology. These include study of edentulous mouth anatomy, muscles of mastication, muscles of facial expression, Temporomandibular joint and its movements, tissues of tooth, study of permanent and primary dentition. Some physiological aspects such as phonation, deglutition should also be learnt.

Anatomic Study models, slides, charts, internet, references should be the main part of learning activity which should be followed in this chapter.

Curriculum Objectives

- To understand the basic anatomy & physiology of head and neck region.
- To know and understand the morphology of primary and permanent dentition.

Syllabus

- Introduction to Human dentition
- Human dental formula and types of teeth
- Dental tissues – Enamel, Dentine & cementum
- Tooth numbering system –Palmer's & FDI system
- Functions of Teeth
- Tooth morphology – surfaces, crown morphology of primary and permanent teeth
- Occlusion and Arrangement of teeth
- Muscles of mastication - Anatomy
- Temporomandibular joint -Anatomy and Movements
- Mastication, Deglutition and Phonation

Suggested activity:- discussion, experiments, assignments, demonstrations, chart, models

Exercise/Experiments

- Tooth carving in wax and plaster

Anatomic Teeth Carving

Maxillary

- 1 Central incisor
- 2 Lateral incisor
- 3 Canine
- 4 I premolar
- 5 II premolar
- 6 III molar

Mandibular

- 8 Lateral incisor
- 9 Canine
- 10 I premolar
- 11 II pre molar
- 12 First molar

In the above two sets of practicals the students are directed to do the anatomical size of the above tooth. To do so the student must be thorough in the morphological features of all the tooth from all sides.

(labial/ buccal, palatal/ lingual, mesial, distal, occlusal/ incisal aspect)

The carving is done in wax blocks using wax carver, the normal anatomical dimensions of the particular tooth should be reproduced.

Points for Discussion

- Human dentition – primary & permanent dentition
- Tissues of tooth, such as enamel, dentine, cementum, pulp
- Tooth numbering system, palmer's system, FDI system.
- Functions of tooth like aesthetics, phonation and mastication
- Morphology of primary and permanent tooth (crown only)
- Occlusion and arrangement of tooth

- Anatomy of edentulous upper and lower mouth
- Muscles of mastication- masseter, temporalis, medial pterygoid, lateral pterygoid, its origin, insertion, blood supply, nerve supply and action
- Temporomandibular Joint, its anatomy and its movements
- Mastication, deglutition, phonation

Consolidation

- Anatomical landmarks in upper and lower edentulous mouth
- Functions of tooth, and different types of dentition and tooth numbering system
- Morphology of primary and permanent teeth
- Muscles of mastication and its action on TMJ



UNIT PLAN - UNIT 4
APPLIED ORAL ANATOMY

Curriculum Objectives	Concepts	Process skills	Activity	Learning Aids	Evaluation
<ul style="list-style-type: none"> To understand the basic anatomy and physiology of head and neck region. To know and understand the morphology of primary and permanent dentition 	Human dentition Dental tissues Tooth numbering Functions of tooth Tooth morphology Occlusion and arrangement Anatomy of edentulous upper and lower mouth Muscles of mastication	Observation Communication	Discussion Demonstrations Charts Models Experimentation Projects Assignments	Charts showing tissues of tooth Notes with discussion points Materials needed for project Charts showing primary and permanent dentition morphology Models of both dentition Models of TMJ	Participation in discussion Prepared notes and assignments Collection of materials

5. DENTAL MECHANICS

Introduction

This chapter deals with lifeline of dental technology course. Dental mechanics include the techniques of fabrication of complete dentures and partial dentures. The main part of the learning activity should be hands on training program, practical, study models

Curriculum Objectives

- To understand various steps involved in construction of complete dentures
- To know different partially edentulous positions and designing and fabrication of fixed and removable partial dentures
- To understand the repair, relining and rebasing procedures of complete dentures
- To know the principles of wire bending and construction of various clasps used in orthodontics

Syllabus

- Steps in construction of complete denture
- Impression, preservation and boxing-in
- Cast preparation, trimming including orthodontic cast
- Cast duplication – various methods
- Construction of special trays – spacers
- Bite blocks, base plate wax rims
- Articulators, classification and uses
- Articulation, curve of spee
- Compensating curve, lateral curve
- Principles of selection of teeth
- Setting of teeth and waxing
- Flasking, dewaxing, packing, curing and deflasking

- Finishing and polishing of dentures
- Principles of partial denture, parts, design clasp, surveyor, surveying path of insertion and removal
- Principles of wire bending , wrought clasps, occlusal rests
- Fixed partial dentures, parts, types of pontics

Suggested activity:- Discussion, demonstrations, practicals, charts, models, experiments, field visits, reference books/ journals

Experiments/Practicals

- 1 Plaster of Paris Cube
- 2 Plaster of Paris Rectangle 1 x2 inches
- 3 Plaster of Paris Pyramid 2 x 4 inches

The aim of the above work is to get introduced to gypsum products, mainly plaster of paris, its properties, its manipulation, w:p ratio, setting time, mixing time, factors affecting setting time and mixing time and finishing and polishing.

- 4 Edentulous upper impression
- 5 Edentulous lower impression
- 6 Dentulous upper impression
- 7 Dentulous lower impression

The aim of the above is to get introduced to various impression taking techniques, selection of trays, various impression materials, manipulation of impression materials, loading of materials to the impression trays and recognizing a good impression, and the need for a good impression .

- 8 Dentulous upper model
- 9 Dentulous lower models
- 10 Edentulous upper models
- 11 Edentulous lower model

By doing the above exercises the student get the knowledge of making an ideal model, both working as well as diagnostic models. Base forming techniques such as 'Boxing' should be emphasized. Trimming of bases should also be given importance.

- 12 Shellac base plate special trays upper
- 13 Shellac base plate special trays lower
- 14 Heat cure special tray any one (upper or lower)

15 Cold cure special Tray one (upper or lower)

The above practicals should make the student well versed in making special trays made of shellac base plate, heat cure acrylic resin and cold cure acrylic resin. The students must be taught the manipulation techniques of shellac base plate (both dry and wet heat methods), manipulation of heat and cold cure acrylic resins, its finishing and polishing techniques.

16 Upper and lower bite blocks (occlusal rims)

The 2 parts of bite blocks should be discussed, and its construction methods, its uses and various dimensions also are considered.

17 Articulation

Various steps in articulation, both plane line articulator & Three point articulator should be taught

Setting of teeth

18 First set up

19 Second set up

20 Third set up

21 Fourth set up

22 Final set up

The students should rehearse and get used to the art of setting artificial teeth. Knowing the art and science of setting of tooth is the key to success of an artificial denture. The principles of setting of both anterior and posterior tooth should be taught.

23 Waxing up of denture

24 De articulation

25 Flasking

26 Dewaxing

27 Packing and processing of acrylic resin

28 De Flasking

29 Finishing and processing of denture

These are the final fabrication stages of complete dentures. Each step should be explained. The waxing up technique ,flasking and Dewaxing should be explained. The Various stages of polymerization reaction of acrylic resin should be shown to the students. The polishing agents and finishing techniques should be demonstrated

30 Class II setting

31 Class III setting

These are the deviations from the normal setting or class I setting. The difference in these should be explained. The molar relation is the most important factor.

32 Relining of Dentures

33 Rebasing of Dentures

The above two are the important maintenance techniques of complete dentures after long use. The techniques of doing relining and rebasing should be taught to students.

34 Acrylic Partial Dentures

- a Class I maxillary
- b Class II Mandibular
- c Class III Mandibular
- d Class IV Mandibular

The different classification of Kennedy's in partial denture should be done during the practical classes

35 Surveying of Model

The various types of surveyor, its parts and different surveying tools should be explained.

36 Cast Partial Denture Designing on models

- a Class I
- b Class II modification 1
- c Class II
- d Class II modification 1

Various kennedy's classification and modification of partial denture should be designed in model using inlay wax. All components of partial denture such as saddle, major connector, minor connector, occlusal rest, rest seat, direct retainers, and indirect retainers should be incorporated while designing cast partial dentures.

37 Maxillo facial prosthesis

These are prosthesis used for various conditions and treatments

- a Obturator - mainly used in cleft palate
- b Cap splint - used in bruxism
- c Gunning splint - treatment in fracture of edentulous jaws
- d Screw gag - ankylised jaw

The design, construction, and uses of various maxillo facial prosthesis should be discussed.

38 Fixed prosthodontics

The various types of fixed prosthodontics (FPD) should be dealt with students. Different designs should be considered, parts of FPD such as retainer, pontics and connectors should be discussed. The wax pattern of a three unit bridge should be designed in laboratory.

The following exercises should be done

- Jacket crown
- $\frac{3}{4}$ crown
- Full crown - Premolar
- Full crown – Molar
- Three unit bridge
- Anterior bridge
- Posterior bridge

Exercise

- Bending, boxing and pouring of impression
- Cast preparation and marking of land marks on edentulous cast
- Cast duplication
- Construction of special trays
- Construction of occlusal rims
- Mounting on articulator
- Arrangement of teeth in 3 point articulator and hinge articulator
- Acrylization of denture
- Relining and rebasing of denture
- Repair of broken denture
- Partial denture design using surveyor (demonstration only)
- Preparation of wrought clasp

Points for Discussion

- Steps in construction of complete denture, clinical and laboratory steps.
- Impression- Definition, objectives of impression, classification of impression trays, primary impression, secondary impression, Boxing
- Cast preparation, trimming including orthodontic cast

- Cast Duplication – various methods
- Construction of special trays – spacers, shellac base plates, heat cure acrylic resin, cold cure acrylic resin
- Occlusal rims – definition, dimensions and uses
- Vertical jaw relation- effects of increased and reduced vertical dimensions
- Horizontal jaw relation - centric relation
- Articulators – definition, classification and uses, Articulation
- Principles of selection of teeth,
- Principles of arrangement of teeth - Anterior & Posterior teeth
- Investing (Flasking), Dewaxing, Packing Curing
- Finishing and polishing of dentures
- Relining & rebasing of dentures – indication and methods
- Repair of dentures - Fractured denture, dislodgment & fractured tooth
- Kennedy's classification of partially edentulous arches, Apple Gates rule
- Types of partial dentures - fixed and removable, parts
- FPD- retainers, pontics connectors abutment
- Removable- saddle, major connector, minor connector, direct retainers, indirect retainers, rests and rest seat, replaced teeth
- Principles of partial denture design, surveyor, path of insertion and removal
- Principles of wire bending, preparation of wrought clasp.

Consolidation

- Various steps involved in the fabrication of complete dentures
- Various partially edentulous conditions and their classification(Kennedy's classification)
- Components of cast partial dentures and their functions
- Definition of surveyor, its parts and its implication
- Surveying study models and master cast.
- Wire bending principles, wrought clasp preparation
- Fixed partial denture, definition ,parts and various types of each components



UNIT PLAN - UNIT 5 DENTAL MECHANICS

Curriculum Objectives	Concepts	Process skills	Activity	Learning Aids	Evaluation
<ul style="list-style-type: none"> • To understand various steps involved in construction of complete dentures. • To know different partially edentulous positions and designing and fabrication of fixed and removable partial dentures • To understand the repair, relining and rebasing procedures of complete dentures • To know the principles of wire bending and construction of various clasps used in orthodontics 	<p>Complete denture construction Impression Cast preparation Cast duplication Special trays Occlusal rims Jaw relations Articulators Setting of teeth Flasking Dewaxing Curing Finishing and polishing Relining Repair Rebasing Partial dentures Principles of wire blending</p>	<p>Communication Observation Experiments</p>	<p>Discussion Demonstrations Field visits Models Charts Internet Reference Project</p>	<p>Notes with discussion points Preparing charts and tables Model preparation</p>	<p>Participation in discussion Prepared notes and assignments Problem solving ability Presentation of project report Prepared charts Ability to observe</p>

PART III

SAMPLE QUESTIONS

- 1 Relate stress and different types of stress occurring in relation to dental field.
- 2 Stress occurring during removal of alginate impression material
 - a. Compressive stress
 - b. Tensile stress
 - c. Shear stress
 - d. None of the above
- 3 How oxygen affect metals when they are exposed to oxygen and its implication in dentistry.
- 4 Tarnish and corrosion is the destructive processes occurring in metals, how it affect metals.
- 5 16 is Maxillary Permanent Right First Molar. How FDI tooth numbering system is useful between professionals
- 6 Material used for making complete denture
 - a. heat cure acrylic resin
 - b. stainless steel
 - c. alginate
 - d. plaster of paris
- 7 Wisdom tooth is
 - a. premolar
 - b. 3rd molar
 - c. incisors
 - d. canine
- 8 Maxillary permanent right canine is represented in FDI as
 - a. 13
 - b. 23
 - c. 33
 - d. 43
- 9 Material not used for making special trays
 - a. shellac baseplate
 - b. tin foil
 - c. cold cure cylic
 - d. plaster of paris
- 10 Kennedy's classification having no modification is
 - a. Class I
 - b. Class II
 - c. Class IV
 - d. Class III

- 11 Kind of muscle of mastication
 - a. Masseter
 - b. orbicularis oris
 - c. Platysma
 - d. Rizhorius
- 12 With the help of a diagram explain tissues of tooth
- 13 During mastication jaw movements occur in various directions, how is it made possible and what are those movements.
- 14 While carving the morphology of tooth in wax what are the morphological features that has to be included in maxillary permanent right central incisor
- 15 When you fabricate complete denture what are the laboratory steps involved in that.
- 16 Secondary impression is taken with the special trays, how upper and lower special trays are fabricated in shellac base plate.
- 17 Soft tissue in tooth
 - a. enamel
 - b. dentine
 - c. mastication
 - d. cementum
- 18 Function of tooth does not include
 - a. phonation
 - b. esthetics
 - c. mastication
 - d. breathing
- 19 Total number of tooth in permanent dentition
 - a. 20
 - b. 30
 - c. 32
 - d. 28
- 20 CUSP of Carabelli is seen in
 - a. upper I molar
 - b. Lower I molar
 - c. upper I premolar
 - d. Upper II molar
- 21 Classify articulators used in dentistry
- 22 Construct upper and lower special trays using heat cure acrylic resin, explain laboratory procedures
- 23 Boxing of impression: why it is used?
- 24 While carving the morphological features that have to be included in maxillary permanent right first molar.
- 25 Features that help you to distinguish between primary and permanent tooth, what are they?
- 26 Tooth which is absent in primary dentition.
 - a. incisor
 - b. canine
 - c. premolar
 - d. molar
- 27 Patient comes with a fractured denture and he wants to repair that how will you do that.

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- 28 What is curing cycle of denture
- 29 In which principle or guideline you set anterior tooth in a bite block
- 30 Fabrication of upper and lower bite blocks is an important step during complete denture construction, how is it made, what are its functions and its dimensions.
- 31 Different types of articulators are used in dentistry. How can we classify that.
- 32 Various types of partially edentulous areas can occur in mouth how can we classify them according to Kennedy.
- 33 Material used for taking secondary impression
- a Plaster of Paris Type I
 - b. Impression compound
 - c. Alginate
 - d. Zinc oxide Eugenol Impression paste
- 34 In which principle or guidelines you set posterior teeth in bite blocks
- 35 A partial denture is made of different parts or components. What are they?
- 36 Primary stress bearing area in upper mouth is
- a. Palatal Rugue
 - b. Alveolar ridge
 - c. Fovea palatua
 - d. Mid palatal area
- 37 Secondary stress bearing area in upper mouth is
- a. alveolar ridge
 - b. Buccal shelf area
 - c. incisive papillae
 - d. Palatal Rugue
- 38 While making an artificial crown in mandibular permanent lower I molar what are the important morphological features you should consider.
- 39 Mandibular permanent lower IInd Molar has
- a. 3 cusps
 - b. 4 cusps
 - c. 2 cusps
 - d. 6 cusps
- 40 A good finish is a must for any type of denture. How a good finish and polish can be accomplished.
- 41 An example of direct retainers used in partial denture.
- a. Arrow head clasp
 - b. Adams clasp
 - c. T clasp
 - d. Occlusal rest
- 42 Processing temperature of heat cure acrylic resin
- a. 72^oc
 - b. 100^oc
 - c. 35^oc
 - d. None of the above
- 43 Boiling point of monomer
- a. 100.8^oc
 - b. 98.8^oc
 - c. 105.8^oc
 - d. 110.8^oc



SUGGESTED PROJECT TOPICS

- Making of edentulous upper and lower models and labeling the anatomical landmarks using different colors – aim is to identify and understand the various anatomical landmarks, its functions during the denture usage
- Anatomical carving of permanent tooth in wax — aim is to understand the morphology of all permanent tooth so that the student can identify the individual tooth using the morphological findings
- Cut and paste the pictures of the muscles of mastication and write its anatomy and its importance – aim is to provide information about the four pairs of muscles of mastication, its attachments, blood supply, nerve supply and its functions
- Draw the tabular representation of the various clinical and laboratory steps in construction of complete dentures, this provides the information of various steps involved in the construction of complete dentures.
- Write down the various salient features of the construction of various materials used in the construction of special trays (mention the various materials used in construction of special trays such as shellac base plate, heat and cold cure acrylic resin, tin foils etc. Make students present projects in chart paper the type of special tray they made along with the procedure of construction.
- Draw the picture of bite blocks ,record the salient features of upper and lower bite blocks, its parts, functions
- Try to collect the pictures of various articulators used in dentistry, according to the classification and record the steps involved in articulation procedures
- Draw the various positions of upper and lower anterior tooth during setting procedures, and write the principles involved during its setting procedures
- Draw the various positions of Upper and lower posterior tooth during setting procedures, and write the principles involved during its setting procedures
- Prepare in model the various classification of Kennedy's and its modification (Kennedy's classification of partial dentures). Special note to be taken to make understand the position of saddle in each classification
- Design a removable partial denture in a model with the assistance of the lecturer. Make understand the various parts of removable partial denture, its uses and design.
- Design a Fixed partial denture in a model. Draw the picture and understand the different parts of FPD



REFERENCE BOOKS

- Wheeler's Dental anatomy, physiology and occlusion
- Clinical dental prosthesis : H.R.B Fenn, K.P Liddelow, A.P Gimson
- Skinner's Dental materials
- Syllabus of complete dentures : Heartwell.C.M & Rahn.A.O
- A colour atlas of complete dentures : Hobkirk.J.A
- Manual of tooth carving : Syed sadatulla
- Clinical text on complete denture prosthodontics : Nithin kumar, Agarwal
- Notes on dental materials : VK Subarao
- Basic dental materials- : Manappallil
- Dental lab procedures Vol 1, Vol 2, Vol 3 : Rud Kenneth D and others
- Essentials of complete denture prosthodontics
- McCracken's removable partial denture prosthodontics : Henderson Davis
- Fundamentals of Fixed prosthodontics : Shillingburg Herbert
- Boucher's prosthodontics treatment for edentulous patients

