Virginia Western Community College
DNH 214
Practical Materials for Dental Hygiene

Prerequisites:
None

Course Description:
Studies the current technologic advances, expanded functions, and clinical/laboratory materials used in dental hygiene practice. Provides laboratory experience for developing skills in the utilization and applications of these technologies and functions.

Semester Credits: 2 **Lecture Hours: 1** **Lab/Clinical/Internship Hours: 1**

Required Materials

Textbook:
Dental Materials. Clinical Applications for Dental Assistants and Dental Hygienists. Hatrick, Eakle, & Bird. 3rd Edition. ISBN: 9781455773855

Clinical Practice of the Dental Hygienist. Esther M. Wilkins. 12th Edition. ISBN: 9781451193114

Virginia Western Community College Dental Hygiene Student Guidelines & Procedure Manual 2016-2017

Supplementary Materials provided:
Practical Materials for Dental Hygiene Laboratory Book – Lab Activities & Skill Assessments

Course Outcomes
At the completion of this course, the student should be able to:

- Apply the current technologic advances, expanded functions, and clinical application for the materials used in dentistry and dental hygiene practice.

Topical Description

Unit 1: Introduction to Dental Materials

- Introduction to Dental Materials
- Role of the Allied Oral Health Practitioner and Dental Materials
- Historical Development of Dental Materials
- Agencies Responsible for Standards
- Oral Environment and Patient Considerations
- Physical Properties of Dental Materials
- General Handling and Safety
- Material Hazards in the Dental Office and Lab
- Chemical Safety in the Dental Office and Lab
- Chemical Toxicity
- Personal Chemical Protection
- Control of Chemical Spills
- Storing and Disposal of Chemicals
- Occupational Safety and Health Administration
- Hazard Communication Standard
- Bio-aerosols in the Dental Setting
- Patient Safety
- Preventive Materials
- Pit and Fissure Sealants
- Whitening Materials and Procedures
- Shade Taking Prior To Whitening Dentition
- Preventive and Corrective Oral Appliances

Unit 2: Principles of Bonding

- Principles of Bonding Preventive and Restorative Materials
- Composite, Veneers, Glass Ionomer, and Compomers
- Shade Taking Terminology and Procedures for Esthetic Restorations
- Dental Ceramics, Feldspathic Porcelain, and Porcelain-Metal Restorations
- Alloy Versus Amalgam
- Silver Based Amalgam Alloy Particles
- Composition of Amalgam
- Setting Transformation and Reactions of Amalgam
- Tarnish, Corrosion, Creep, Dimensional Change, and Strength with Amalgam
- Bonding Amalgam
- Handling Characteristics and Mercury Safety Procedures

Unit 3: Abrasion, Finishing and Polishing, Impression Materials

- Factors Affecting Abrasion
- Delivery Design Of Abrasives
- Materials Used In Abrasion
- Finishing And Polishing Procedures
- Margination And Removal Of Flash
- Polishing Amalgam, Composite, Gold Alloy, Porcelain, Resin/Cement Interface
- Safety/Infection Control With Finishing And Polishing
- Impression Materials And Trays
- Elastic Impression Materials
- Disinfecting Impressions And Casts
- Properties And Behaviors Of Gypsum Products
- Classification Of Gypsum Products & Investment
- Manipulation, Water-To-Powder Ratio, And Mixing Of Gypsum
- Initial Setting Time, Working Time And Final Setting
- Control Of Setting Times Of Gypsum
- Fabrication And Trimming Diagnostic/Working Casts
- Storage, Clean-Up, And Infection Control Issues
- Separating Impression From The Cast
- Trimming Casts
- Composition And Properties Of Waxes
- Melting Range, Flow, Excess Residue And Dimensional Change Of Waxes
- Classification Of Waxes
- Pattern Waxes, Processing Waxes, And Impression Waxes
- Manipulation Of Waxes
- Lost Wax Technique

Unit 4: Polymers for Prosthetics, Provisionals, Casting Metals, Solders, Wrought Metal Alloys and Dental Cement

- Purpose Of Prosthetics
- Types Of Prosthetics
- Types Of Materials Utilized In Prosthetics
- Process And Procedures For Prosthetic Development
- Maintenance And Home Care Of Prosthetics
- Purpose Of A Provisional
- Types Of Materials Utilized In Provisionals
- Contributing Factors On Selecting Provisional
- Technique In Placement
- Adequate And Correct Cement Selected For The Specific Provisional
- Maintenance And Home Care Post Placement
- Casting Alloys, Solders, Wrought Metal Alloys

- Metals Used In Orthodontics
- Endodontic Posts
- Cement Uses
- Types Of Cement And Strength
- Technique And Placement Of Cement
- Manipulation And Mixing Of Cements

Unit 5: Implants

- Implant Materials
- Subperiosteal, Transosteal, Endosseous, and Mini Implants
- Implant Procedures And Placement
- Maintenance, Home Care and Hygiene Visits For Patients With Implants
- Implant Failure

Course Objectives

Chapter 1: Introduction to Dental Materials

- Discuss the importance of the study of dental materials for the allied oral health practitioner.
- Discuss why it is necessary that the allied oral health practitioner have an understanding of dental materials for the delivery of dental care.
- Discuss evidence-based decision-making (EBDM) as it relates to dental materials; what questions might you ask yourself or your practice to make sure you are increasing the potential for successful patient care outcomes?
- Review the historical development of dental materials.
- List and compare the agencies responsible for setting standards and specifications of dental materials.
- Discuss the requirements necessary for a consumer product to qualify for the ADA Seal of Acceptance.

Chapter 2: Oral Environment and Patient Considerations

- Discuss the qualities of the oral environment that make it challenging for long-term clinical performance of dental materials.
- Describe the long-term clinical requirements of therapeutic and restorative materials.
- List and give examples of the four types of biting forces and the tooth structures most ideally suited to them.
- Define stress, strain, and ultimate strength and compare the ultimate strength of restorative materials during each type of stress to tooth structures.
- Describe the effects of moisture and acidity on dental materials.

- Describe the clinical significance of galvanism and how it can be prevented.
- Define thermal conductivity and thermal expansion and contraction and compare the values of thermal expansion and conductivity of restorative materials with those of tooth structures.
- Describe the process used to achieve mechanical, chemical, and bonding retention.
- Describe the factors that determine successful adhesion, including wettability, viscosity, film thickness, and surface characteristics.
- Describe micro leakage and how the results of this process can lead to recurrent decay and postoperative sensitivity.
- Define biocompatibility and discuss why requirements for biocompatibility may fluctuate.
- Compare the three visible light wavelengths that are sensed when recognizing color.
- Describe tooth color in terms of hue, value, and chroma.
- Explain the importance of detection of restorations and methods for detection.

Chapter 3: Physical Properties of Dental Materials

- Define primary and secondary bonds and give an example of how each determines the properties of the material.
- Describe the three forms of matter and give a defining characteristic of each.
- Define density and explain the relationship of density, volume, and crystalline structure.
- Define hardness and describe how hardness contributes to abrasion resistance.
- Define elasticity and give an example of when elasticity is desirable in dental procedures.
- Relate stiffness and proportional limit, and describe how these properties apply to restorative dental materials.
- Define ductility and malleability and explain how these characteristics contribute to the edge strength of a gold crown.
- Differentiate between toughness and resilience.
- Define brittleness and discuss how this property applies to restorative dental materials.
- Define viscosity and thixotropic materials and describe the clinical significance of each.
- Differentiate between therapeutic, preventive, and restorative materials.
- Discuss the component classifications that may make up a dental material.
- Describe the reaction stages a material undergoes to acquire its final state.
- Describe the variables in the manipulation of a material.

Chapter 4: General Handling and Safety

- Identify five job-related health and safety hazards for employees in dental offices, and explain the methods of prevention for each one.
- Explain the components of the Occupational Safety and Health Administration Hazard Communication Standard.
- Describe the ways that chemicals can enter the body.
- Describe the employee and employer responsibility for safety training.
- Describe the basic infection control methods for the handling of dental materials in the treatment area.
- Identify the concepts and benefits of going green in the dental practice.
- Discuss how the ADA Top Ten Initiatives of sustainability can be incorporated into a general dental practice.

Chapter 7: Preventive and Desensitizing Materials

- Fluoride and Caries Control
- Sealants
- Desensitizing agents
- Remineralization products

Chapter 8: Teeth Whitening Materials and Procedures

- Describe how whitening materials penetrate the tooth.
- Explain the differences between professionally supervised home whitening and over-the-counter (OTC) systems.
- Describe the precautions to take to protect the oral tissues when applying in-office power whitening products.
- Compare the whitening materials used for in-office, take home, and OTC home use.
- List the potential side effects of home whitening.
- Describe the methods to whiten nonvital teeth.
- Discuss the relative effectiveness of whitening products and whitening toothpastes in removing stains from teeth.
- List the steps in the procedures for in-office power whitening.
- Fabricate home whitening trays.
- Demonstrate to a patient how home whitening products are used.
- Describe clinical situations in which enamel microabrasion might be used.
- Explain how enamel microabrasion works.

Chapter 19: Preventive and Corrective Oral Appliances

- Describe the uses of mouth guards.
- List the materials for the fabrication of mouth guards.
- Explain to a patient how to care for a mouth guard.
- Fabricate a sports mouth guard.
- Describe what obstructive sleep apnea is.
- Describe the use of oral appliances to prevent snoring or obstructive sleep apnea.
- Explain how space maintainers prevent the drifting of teeth and loss of space.
- Describe how thermoplastic orthodontic aligners work.

Chapter 5: Principles of Bonding

- Discuss the effects of acid etching on enamel and dentin.
- Describe the basic steps of bonding.
- Explain the differences between bonding to enamel and bonding to dentin.
- Discuss the significance of the smear layer.
- Describe “wet” dentin bonding.
- Compare total-etch and self-etch bonding techniques.

- Explain how the hybrid layer is formed and its importance in bonding to dentin.
- Discuss the factors that interfere with good bonding.
- Discuss the adverse effects of microleakage at restoration margins.
- Describe how to bond ceramic veneers.
- Describe the bonding of orthodontic brackets.
- Describe the bonding of endodontic posts.
- Explain the differences in bonding to enamel, dentin, metal, and ceramic.
- List the factors that contribute to tooth sensitivity after bonding.
- Etch enamel and dentin with phosphoric acid as permitted by state law.
- Apply a bonding system to etched enamel and dentin as permitted by state law.

Chapter 6: Composites, Glass Ionomers and Compomers

- Describe the various types of composite resin restorative materials.
- Discuss the advantages, and disadvantages, of each type of composite resin.
- Discuss the similarities and differences among chemical-cured, light-cured, and dual-cured composite resins.
- Describe how fillers affect the properties of composites.
- Explain why incremental placement of composite resin is recommended.
- Describe the factors that determine how long an increment of composite resin should be light-cured.
- Place a sectional matrix for a class II composite.
- Select an appropriate type of composite for a class II cavity preparation.
- As permitted by state law, place a composite in a class II cavity preparation.
- Light-cure a composite resin restoration following recommended exposure times.
- As permitted by state law, finish and polish a class III composite restoration.
- Discuss the procedural differences between direct and indirect composite restorations.
- Describe the composition of glass ionomer restoratives and their uses, advantages, and disadvantages.
- Explain the effects of fluoride-releasing, resin-modified glass ionomer restorations in the prevention of recurrent caries.
- List the components of compomers.
- Describe the uses of compomers.
- Compare the clinical applications of composite resin restorative materials with glass ionomer cement restorative materials.

Chapter 9: Ceramics

- Discuss the attributes and shortcomings of dental porcelains.
- Compare the clinical applications of restorations made from porcelain with those made from lithium disilicate.
- Explain why crowns made from zirconia can be used to restore molars.
- Describe the methods used to process ceramic restorations.
- Present a rationale for the selection of ceramic materials for restorations used in the anterior and posterior parts of the mouth.
- Describe how porcelain bonds to metal for porcelain-fused-to-metal (PFM) crowns.
- Select a cement for use with glass-based ceramic materials.
- Describe common causes for failure of ceramic restorations.
- Finish and polish ceramic restorations without generating too much heat or stress in the material.
- Compare the relative strengths of feldspathic porcelain, lithium disilicate, and zirconium.
- Explain how CAD/CAM technology is used to fabricate a ceramic crown.
- List the clinical applications for all-ceramic restorations.
- Prepare the ceramic restoration for bonding with a resin cement.
- Define chroma, value, and hue.
- Identify ideal conditions in the operatory for shade taking

Chapter 10: Dental Amalgam

- Discuss the safety of amalgam as a restorative material.
- List the main components in dental amalgam.
- Describe the advantages of high-copper amalgams over low-copper amalgams.
- Explain the role of the gamma-2 phase in corrosion of amalgam.
- Describe the particle shapes in lathe-cut, admix, and spherical alloys, and discuss their effects on the condensation resistance of freshly mixed amalgam.
- Define creep, corrosion, and tarnish associated with amalgam.
- Compare the strength of amalgam with composite resin or glass ionomer cement.
- Discuss the effect of mixing time on the strength and manipulation of amalgam.
- Discuss the advantages and disadvantages of amalgam as a restorative material.
- Describe safe mercury hygiene practices in the dental office.
- Describe how to properly collect and process amalgam scrap for recycling.
- List the different classes of amalgam restorations

Chapter 13: Abrasion, Finishing and Polishing

- Define abrasion, finishing, polishing, and cleaning.
- Discuss the purpose of finishing, polishing, and cleaning of dental restorations and tooth surfaces.
- Identify and discuss the factors that affect the rate and efficiency of abrasion.
- Compare the relative ranking of abrasives on restorations and tooth structures.
- Describe methods by which dental abrasives are applied.
- Discuss the contraindications to the use of abrasives on tooth structure and restorations.
- Describe the clinical decisions made to determine which abrasive to use when finishing, polishing, or cleaning dental restorations or tooth structures.
- Describe the abrasives and the procedures used for finishing and polishing metals, composite, and porcelain.
- Describe the abrasives and the procedures used for polishing and cleaning metals, composite, ceramic, and gold alloys as part of oral prophylaxis.
- Describe the safety and infection control precautions taken by the operator when using abrasives.
- Relate the instructions given to patients to prevent and remove stain from tooth surfaces and restorations.

Chapter 15: Impression Materials

- Describe the purpose of an impression.
- Describe the three basic types of impressions.
- Explain the importance of the key properties of impression materials.
- Define sol and gel and describe these states as they occur with hydrocolloids.
- Explain why alginate is an irreversible hydrocolloid.
- List the supplies needed to make an alginate impression and explain how they are used.
- Select trays for alginate impressions for a patient.
- Mix alginate, load and seat the tray, and remove the set impression.
- Evaluate upper and lower alginate impressions, in accordance with the criteria for acceptability.
- Disinfect alginate impressions and prepare them for transport to the office laboratory.
- Troubleshoot problems experienced with alginate impressions.
- Describe the various types of elastomers and explain why they are called elastomers.
- Compare similarities and differences among the physical properties of polyvinyl siloxane (PVS) and polyether impression materials.
- Discuss the advantages and disadvantages of using polyether impression material for a crown impression.
- Explain why polyvinyl siloxane impression material is so popular.
- Explain the difference between a hydrophobic and a hydrophilic impression material.

- Evaluate cord placement and gingival retraction for acceptability.
- Use ferric sulfate astringent to control gingival bleeding before making an impression.
- Make a registration of a patient's bite in centric occlusion.
- Assemble the cartridge of impression material with mixing tip and load into the dispenser.
- Explain what a digital impression is.
- Describe the advantages and disadvantages of digital impressions.

Chapter 16: Gypsum and Wax Products

- Differentiate between negative and positive reproduction.
- Differentiate among diagnostic cast, working cast, and dies.
- Describe the chemical and physical nature of gypsum products.
- Explain the manufacturing process for gypsum products and how this affects their physical characteristics.
- Compare the following properties and behaviors of gypsum products: strength, dimensional accuracy, solubility, and reproduction of detail.
- Explain initial and final set of gypsum and the factors that affect the setting time, setting expansion, and strength.
- Explain the procedure for mixing and handling gypsum products to create diagnostic casts.
- Identify the common components of dental waxes.
- Compare the properties of waxes.
- Describe the clinical/laboratory significance of each of the properties of waxes.
- Discuss the three classifications of waxes.
- Differentiate between direct and indirect waxings and identify which property of dental waxes is most important in their difference.
- Describe the usual color, form, and use of inlay, casting, baseplate, boxing, utility, and sticky waxes.
- Prepare model plaster or stone for pouring.
- Pour the anatomic portion of maxillary and mandibular diagnostic casts.
- Pour the base portion of maxillary and mandibular diagnostic casts.
- Trim maxillary and mandibular diagnostic casts.
- Obtain a bite registration, using bite registration or utility wax.

Chapter 17: Polymers for Prosthetic Dentistry

- Describe the formation of long-chain polymers from monomers.
- Explain the effect that cross-linking has on the physical and mechanical properties of polymers.
- Describe the stages of addition polymerization.
- Explain the function of a free radical.
- List the important properties of acrylic resins.
- Describe the procedure for heat processing a denture.

- Explain the importance of control of heat and pressure when processing a denture.
- Compare the properties of hard and soft lining materials.
- List the indications for long- and short-term soft liners.
- Compare the advantages and disadvantages of chairside and laboratory-processed hard liners.
- List the indications for the use of acrylic denture teeth versus porcelain teeth.
- Repair a broken acrylic denture.
- Use an ultrasonic cleaner for cleaning complete and partial dentures in the office.
- Educate patients regarding the home care regimen they should follow for complete and partial dentures.
- Inform patients of the precautions they should take when cleaning their dentures.

Chapter 18: Provisional Restorations

- Explain the purpose of provisional coverage.
- Describe examples of circumstances that may require provisional coverage.
- Identify the criteria necessary for a high-quality provisional restoration.
- Describe the properties of provisional materials.
- Distinguish among properties that are important for posterior coverage, anterior coverage, and both anterior and posterior coverage.
- Distinguish between intracoronal and intracoronal restorations.
- Summarize the advantages and disadvantages of preformed and custom crowns.
- Differentiate among direct, indirect, and vacuum former fabrication techniques.
- Summarize the advantages and disadvantages of acrylic and bis-acrylic composite provisional materials.
- Describe the technique for fabrication of metal, polycarbonate, custom, and cement provisional restorations.
- Summarize patient education and home care instructions.

Chapter 11: Casting Metals, Solders, and Wrought Metal Alloys

- Describe the differences among the types of gold alloy used for dental restorations.
- Define karat and fineness.
- Differentiate among high-noble, noble, and base metal alloys.
- Describe the characteristics needed for porcelain bonding alloys.
- Describe the characteristics of metals used for casting partial denture frameworks.
- Explain the biocompatibility problems associated with some alloys.
- Explain how solders are used.
- List metals used for solders.
- Describe how wrought metal alloys differ from casting alloys.
- Describe the uses of wrought wire.
- Explain the use of the different types of metal wire for orthodontic arch wire.

- Prepare the surfaces of teeth for bonding of an orthodontic bracket.
- Select and use a resin cement to bond an orthodontic bracket (as permitted by state law).
- Describe the types of materials used for preformed endodontic posts.

Chapter 14: Dental Cement

- Compare the various types of cements and the uses of cements in dentistry for: Pulpal protection, Luting, Restorations, and Surgical dressing
- Describe the properties of cement, and explain how these properties affect selection of cement for a dental procedure.
- Identify the components of each dental cement.
- Describe how these components affect the properties of the cement.
- Compare the advantages and disadvantages of each cement.
- Describe the manipulation considerations for mixing cements.
- Describe the procedure for filling a crown with luting cement.
- Describe the procedure for removing excess cement after cementation.

Chapter 12: Dental Implants

- Describe the components of an implant used for a crown.
- Describe the most common materials used for dental implants.
- Explain osseointegration of an implant.
- Discuss the indications and contraindications for dental implants.
- Explain the advantages of image-guided implant surgery.
- Identify risks to the patient for implant surgery.
- Describe the sequence of the one-stage surgical procedure.
- Present postsurgical instructions to a patient.
- Compare the one-stage, two-stage, and immediate surgical procedures.
- Discuss the pros and cons of immediate loading of an implant.
- Explain the process of taking an implant impression.
- Compare the open-tray and closed-tray impression procedures.
- Make an impression for an implant, using the open- or closed-tray procedure (as permitted by state law).
- Identify the uses for mini-implants.
- Define the types of bone grafting.
- Describe the purpose of the sinus lift procedure.
- Describe the assessments that should be done for dental implants at the hygiene visit.
- Demonstrate to a patient the use of home care aids for dental implants.
- Explain the rationale for the use of plastic instruments for cleaning titanium implants.

Note to Instructors