



AMERICAN COLLEGE OF
PROSTHODONTISTS
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DIGITAL DENTISTRY CURRICULUM

FOR PREDOCTORAL AND ADVANCED EDUCATION

IN PROSTHODONTICS

ACKNOWLEDGEMENTS

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VOLUNTEER RECOGNITION

The Digital Dentistry Curriculum Team was made up of a number of volunteers who invested their expertise and many hours into this project. Without their leadership on this project, this resource for the dental community would not have been possible.

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LEARNING OBJECTIVES AND COMPETENCIES

Predocloral Digital Dentistry:

COMPETENCIES, LEARNING OBJECTIVES,

AND ASSESSMENT





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INTENT STATEMENT

The following competencies and learning objectives are guidelines for institutions and programs to adopt and modify as they see fit. Institutions can use the document to identify competencies to include in their curriculum based on the institution's goals, resources, accepted general practitioners responsibilities, and other influencing factors. Adopting competencies is a critical step in ensuring that each student graduates competent in the application of digital technology. It ensures the broad based learning, knowledge, application, and institutional environment that is needed to realize this. The ultimate goal of the following competencies is for students to receive instruction and experience necessary to become competent in providing care using digital technologies for dentate, partially edentulous, and completely edentulous patients.

Overall Competency

Students must be competent in utilizing appropriate methods for the assessment, diagnosis, treatment planning, and application of digital technologies for the restoration and rehabilitation of dentate, partially edentulous, and completely edentulous patients. To include the following:

**SINGLE-UNIT RESTORATION**

Tooth- and implant-supported, single-unit restorations for dentate and partially edentulous patients.

**REMOVABLE PROSTHESIS**

Removable prostheses for partially and completely edentulous patients.

OVERALL COMPETENCY

LEARNING OBJECTIVES

KNOWLEDGE | *Students should be able to:*

1. Recall and recognize the fundamentals, advantages, and disadvantages of digital technology.
2. Evaluate, select, and identify indications and contraindications of digital technologies and dental materials based on the best evidence available.
3. Describe the principles of preparation and design for fixed and removable digital prostheses.
4. List the steps of complete digital workflow for patient care in the clinic.
5. Describe the insertion process for digitally fabricated fixed and removable prostheses.
6. Identify, diagnose, and refer patients requiring prosthodontic rehabilitations utilizing advanced digital dentistry that is beyond the scope of the didactic and clinical competency of the newly graduating general practitioner.

SKILLS | *Students should be able to:*

1. Apply digital technologies to assessment, diagnosis, and treatment planning (e.g., CBCT, digital photos).
2. Identify indications and limitations of digitally designed and fabricated fixed and removable prostheses.
3. Assess, diagnose, treatment plan, and deliver digitally scanned and designed fixed and removable prostheses for dentate, partially edentulous, and completely edentulous patients.
4. Perform appropriate tooth preparations for digitally designed prostheses (e.g., tooth-supported restoration, removable partial dentures).
5. Perform self assessment using digital technology to evaluate wax-ups, preparations, and provisional restorations.
6. Perform intraoral and lab-based scanning for fixed and removable prostheses.
7. Evaluate digital models and proposed digital designs for fixed and removable prostheses.
8. Select appropriate restorative materials for digitally designed and fabricated fixed and removable prostheses.
9. Perform self assessment and make appropriate adjustments to the digital designs and/or preparations.
10. Create laboratory prescriptions for a digitally designed fixed and removable prostheses.
11. Accurately assess and modify the esthetic and functional outcomes of the prostheses. Select and utilize proper insertion procedures.
12. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.
13. Self-assess the clinical outcomes.

The overall competency relative to digital dentistry has been divided into two separate “sub-competencies” for I) single-unit restorations and II) removable prostheses that may be used at the discretion of the institution.

OVERALL COMPETENCY

SUB-COMPETENCY

I. SINGLE-UNIT RESTORATION

COMPETENCY STATEMENT

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with tooth- and implant-supported, single-unit restorations for dentate and partially edentulous patients.

LEARNING OBJECTIVES

KNOWLEDGE | *Students should be able to:*

1. Recall and recognize the fundamentals, advantages, and disadvantages of digital technology.
2. Evaluate, select, and identify indications and contraindications of digital technologies and dental materials based on the best evidence available.
3. Describe the principles of preparation and design for digital restorations (e.g., all-ceramic).
4. List the steps of complete digital workflow for patient care in the clinic.
5. Describe the cementation process for dental materials (e.g., Lithium Disilicate) available for digitally fabricated restorations.
6. Identify, diagnose, and refer patients requiring prosthodontic rehabilitations utilizing advanced digital dentistry that is beyond the scope of the didactic and clinical competency of the newly graduating general practitioner.

SKILLS | *Students should be able to:*

1. Apply digital technologies to assessment, diagnosis, and treatment planning (e.g., CBCT, digital photos).
2. Identify indications and limitations of digitally designed and fabricated single-unit restorations.
3. Assess, diagnose, treatment plan, and deliver digitally scanned and designed single-unit restorations for dentate and partially edentulous patients.
4. Perform appropriate tooth preparation for digitally scanned and designed (e.g., all-ceramic) restorations.
5. Perform self assessment using digital technology to evaluate wax-ups, preparations, and provisional restorations.
6. Perform intraoral and lab-based scanning for tooth- and implant-supported restorations.
7. Evaluate digital models and proposed digital designs for single-unit restorations.
8. Select appropriate restorative materials for digitally designed and fabricated restorations.
9. Perform self assessment and make appropriate adjustments to the digital designs and preparations.
10. Create laboratory prescriptions for single-unit digital restorations.
11. Accurately assess and modify the esthetic and functional outcomes of the restorations. Select and utilize proper cementation procedures.
12. Apply digital technologies for communication and collaboration, while understanding compliance issues in digital transfer of files and patient information.
13. Self-assess the clinical outcomes.

OVERALL COMPETENCY

SUB-COMPETENCY

II. REMOVABLE PROSTHESES

COMPETENCY STATEMENT

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with removable prostheses for partially and completely edentulous patients.

LEARNING OBJECTIVES

KNOWLEDGE | *Students should be able to:*

1. Recall and recognize the fundamentals, advantages, and disadvantages of digital technology.
2. Evaluate, select, and identify indications and contraindications of digital technologies and dental materials based on the best evidence available.
3. Describe the principles of preparation and design for removable digital prostheses.
4. List the steps of complete digital workflow for patient care in the clinic.
5. Describe the insertion process for digitally fabricated removable prostheses.
6. Identify, diagnose, and refer patients requiring prosthodontic rehabilitations utilizing advanced digital dentistry that is beyond the scope of the didactic and clinical competency of the newly graduating general practitioner.

SKILLS | *Students should be able to:*

1. Apply digital technologies to assessment, diagnosis, and treatment planning (e.g., CBCT, digital photos).
2. Identify indications and limitations of digitally designed and fabricated removable prostheses.
3. Assess, diagnose, treatment plan, and deliver digitally designed removable prostheses for partially and completely edentulous patients.
4. Perform appropriate tooth preparations for digitally designed prostheses and use digital technologies to self-assess the preparation (e.g., removable partial dentures).
5. Perform intraoral and lab-based scanning for removable prostheses.
6. Evaluate digital models and proposed digital designs for removable prostheses.
7. Select appropriate restorative materials for digitally designed and fabricated removable prosthesis.
8. Perform self assessment and make appropriate adjustments to the digital designs and final prostheses.
9. Create laboratory prescriptions for a digitally designed removable prostheses.
10. Accurately assess and modify the esthetic and functional outcomes of the prostheses.
11. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.
12. Self-assess the clinical outcomes.

Suggested Assessment Plans and Evidence

PRE-PATIENT CARE COURSE ASSESSMENTS

- ▶ *Written Exams*
- ▶ *Station Exams*
- ▶ *Performance Exams*
- ▶ *Self Assessment*

PATIENT EXPERIENCES

ASSESSMENT OF DAILY CLINICAL ACTIVITY BY FACULTY

STUDENT SELF ASSESSMENT OF DAILY CLINICAL ACTIVITY

PATIENT-BASED DIGITAL DENTISTRY PORTFOLIO (tooth-, implant-, and tissue-supported digital prostheses)

PATIENT REPORT (log of all digital patient therapy)

PATIENT CARE PRESENTATION (tooth-, implant-, and tissue-supported digital prostheses)

CLINICAL PERFORMANCE EXAM

OSCE

GLOSSARY

(Adopted from 2015 Commission on Dental Accreditation: Accreditation Standards for Dental Education Programs)

COMPETENCIES

Written statements describing the levels of knowledge, skills, and values expected of graduates.

COMPETENT

The level of knowledge, skills, and values required of students and residents to perform independently an aspect of dental practice after completing the program.

MUST

Indicates an imperative need or a duty; an essential or indispensable item; mandatory.

SHOULD

Indicates an expectation.

CURRICULUM FRAMEWORK

Predoctoral Digital Dentistry

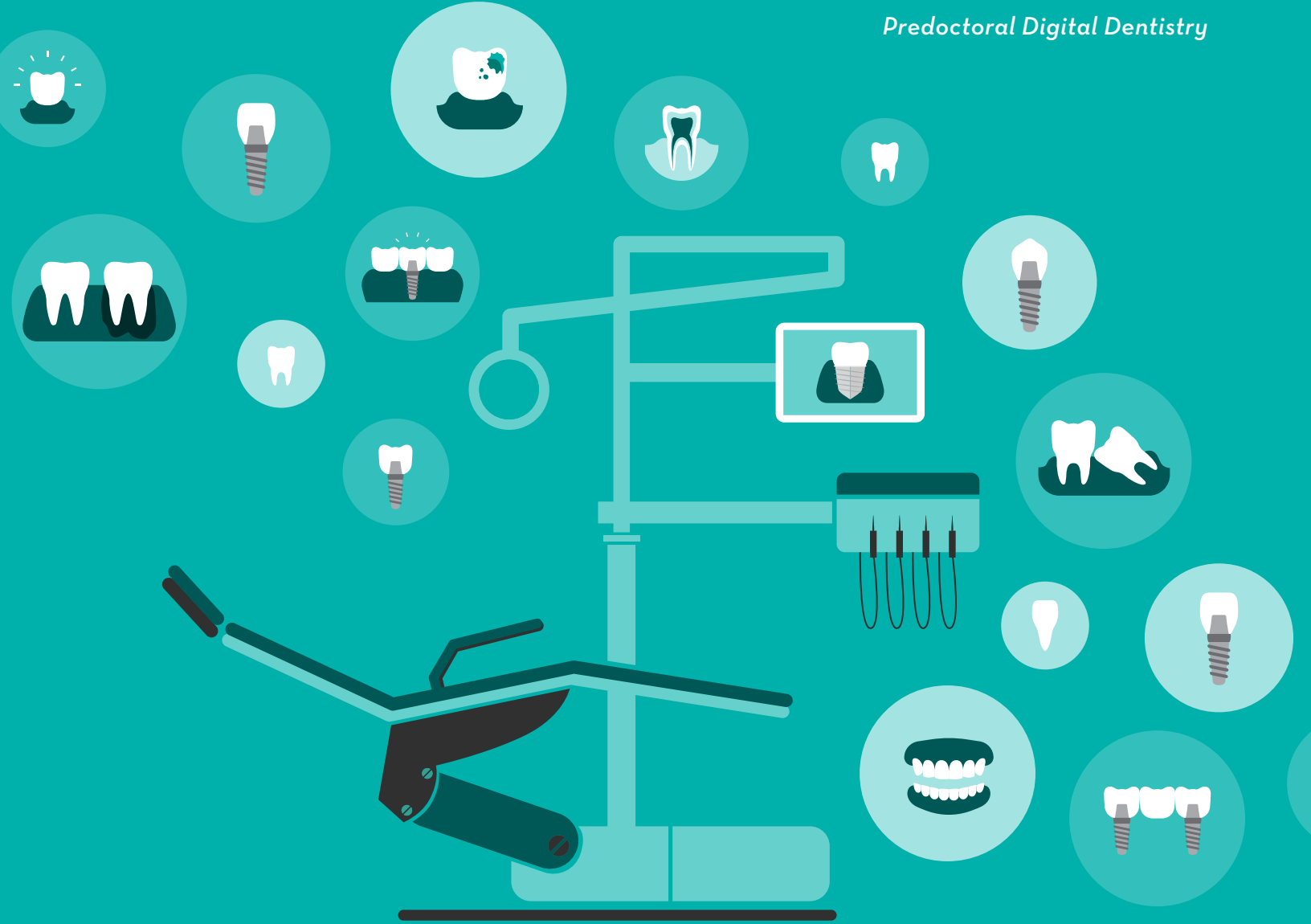


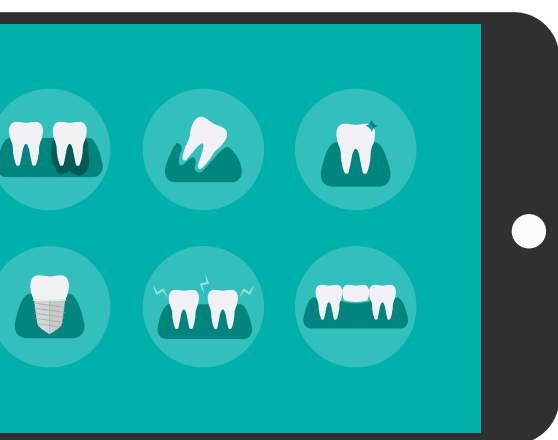
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INTRODUCTION

Digital technology has revolutionized the clinical practice of dentistry, making its inclusion within the curriculum of dental schools essential. According to CODA Standard 2-7, a dental school must have an ongoing curriculum management plan that includes elimination of unnecessary repetition of material, and also includes the incorporation of emerging information and technology. The integration of digital technology into the dental curriculum will have several prongs such as, its clinical application in assessment and diagnosis, radiology, treatment planning, digital impression, digital designing of restorations, and manufacturing technology. As a subgroup of the digital curriculum task force, we have created a curricular framework that identifies opportunities for the inclusion of didactic content, simulation training, and some clinical workflows. Course integration with digital technology and the clinical workflow will provide graduates with the knowledge, skills, and experiences to become competent in providing patient care.

The digital curriculum presented here has been prepared with the above objectives in mind. Several courses are listed with digital technology content that can be incorporated to enhance the education experience for students. Competencies, learning objectives, skills and examples of activity schedules have been described for each course. Clinical workflows have been developed in the areas of dental anatomy, operative, fixed prosthodontics, removable prosthodontics, and implant dentistry to allow for easy adaptation into the existing preclinical and clinical environment.



The ultimate goal of the document is to share a model for integration of digital dentistry into an existing curriculum that will comprehensively deliver digital dentistry content. The suggested course content provides a comprehensive model, but it can also be used for partial delivery of content to assist schools who need to phase in the introduction of digital dentistry. This course provides an adaptive, flexible model that allows schools to assimilate the needed content in a manner and time frame that is specific to the institution's goals and desired outcomes.

Strategies to Implement Digital Dentistry in the Dental Curriculum

INTRODUCTION

*The content of the dental curriculum can be influenced by different factors, from scientific research to public opinion. However, the main objective of the dental curriculum should be to ensure that students are gaining the appropriate knowledge and skills to practice effectively. It is important for dental schools to provide an educational setting that fosters constant improvement and innovation, in order to be in alignment with the goals of the **Accreditation Standards for Dental Education Programs**. Incorporation of best practices in teaching techniques and technologies can help create that environment. According to CODA Standard 2-7, a dental school must have an ongoing curriculum review and evaluation process, which includes elimination of unnecessary repetition of material, and also includes the incorporation of emerging information and technology.*

Over the years there have been numerous instances where curriculum changes were needed with regard to innovating course content. Examples of this include the shift from teaching amalgam to composite and the introduction of dental implants. However, there are barriers that schools must overcome in order to introduce new content into the curriculum, such as lack of flexibility and time in the curriculum structure, limited financial resources (when dealing with new technology), and calibrated instructors with the appropriate body of knowledge necessary for teaching. These are important elements for curricular innovations and will be discussed in the sections on implementation and resources. However, this document will focus on presenting an overall curricular framework that individual segments or the complete framework can be used to integrate digital dentistry into the dental curriculum.

It is known from the literature that digital dentistry can help improve the quality of patient care and pedagogical methodologies. Some positive aspects of including digital dentistry might include and development of guidelines and competences that improve quality of education, patient treatment, and curriculum development.

STRATEGIES RELATED TO IMPLEMENTING CURRICULUM DEVELOPMENT MAY INCLUDE:

A. Dissemination of information among faculty to find support for change:

The incorporation of digital dentistry into an existing curriculum requires the interdepartmental collaboration of faculty members within the institution. Although collaboration is essential, the integration of digital dentistry into the curriculum will require a lead person on the team to coordinate each program's integration plan. The digital dentistry team should be responsible for establishing updates for digital technology and a training program.

B. Faculty and Staff Training

Staff and faculty must be prepared through a process of progressive training that will allow them to support the educational and patient care programs as they develop. This will allow time for the staff and faculty to develop their knowledge and skills. Identifying faculty and staff that are interested adds value for all.

Initially, they may need to be prepared for just the pre-patient courses, allowing them to

gradually develop more advanced skill sets that will ultimately be needed. This process may need to be part of assigned individual responsibilities that allow individuals to reinforce developing knowledge and skill sets on a regular basis. Establishing expectations that allow a progressive development of knowledge and skills over time as the curriculum expands into the clinical years and patient care services. These skills can take 2-3 years to adequately develop.

Full-time staff (Digital Designer, etc) that are specifically identified can be supportive to the faculty and the IT team in maintaining and advancing the technology and needed knowledge/skills. They can also support internal training programs.

Initial training can occur through internal mechanisms such as continuing education, grand-rounds, lunch and learns, and teaching in-services. Some initial training may be required by the vendor either at the training facility or at the institution for a select group of faculty and staff who will lead the school's digital initiative. Additionally, some adjunct faculty who use technology within their practices may also be a resource to support the integration of digital dentistry into the existing curriculum.

C. Identify existing course that either already contains digital dentistry or would be ideal for the integration of new content including lectures, hands-on courses, and clinical courses:

The integration of digital dentistry should have a continuous thread across the curriculum with multiple points of delivery at all levels of the program. In this curricular framework, we have suggested the integration of didactic, preclinical, and clinical content for broad application. The curriculum framework is a guide and each institution will need to identify how to integrate the various components into their curriculum. This curricular framework was designed with the idea that each dental school has unique capabilities and needs to initiate this according to its resources.

Digital dentistry is a change in the method of capturing hard and soft tissue, similar to the manner in which polyvinyl siloxane reduced the use of rubber base impression material. This curricular framework gives many examples of how elements of digital dentistry can be introduced within the dental school curriculum. Components of digital dentistry can be integrated into different courses such as radiology, orthodontics, fixed prosthodontics, and diagnosis and treatment planning.

D. Introduction of a separate or elective course in the curriculum:

There are many ways to incorporate digital dentistry into an existing curriculum. It could involve the creation of a single course or an elective course, containing all the digital dentistry content. Alternatively, a phased approach may be the appropriate strategy with the use of an elective course that can be expanded later. Schools need to evaluate their curriculum to determine the best approach, without losing focus of their existing curriculum objectives.

E. Integration of digital dentistry into existing courses:

Each predoctoral and advanced program has a slightly different curriculum. As a result, there is no simple way to incorporate the digital content into lectures within curriculum. The curricular content provided by ACP is designed to be integrated into existing curriculum, or used as a template to create new content. Some modifications may need to be made in the existing curriculum, which could be already crowded. We recommend that course directors develop revision strategies that are consistent with each school's curriculum committee guidelines in order to allocate appropriate time for the new digital content. This may require the elimination of overlapping or redundant material, and require careful mapping of the curriculum to identify areas of opportunity.

Although this may seem daunting, it is important to recall that the CODA Standards 2-23 intend that "graduates should be able to evaluate,

assess, and apply current and emerging science and technology” in the restoration of teeth and replacement of missing teeth. And Standards 2-7 state, “the dental school must have a curriculum management plan that ensures: a. an ongoing curriculum review and evaluation process which includes input from faculty, students, administration and other appropriate sources; b. evaluation of all courses with respect to the defined competencies of the school to include student evaluation of instruction; c. elimination of unwarranted repetition, outdated material, and unnecessary material; d. incorporation of emerging information and achievement of appropriate sequencing.” In addition, since there has been a shift in the amount of commercial laboratories receiving work, this is also an opportunity to prepare students to communicate with laboratories and manage laboratory procedures in a digital paradigm.

F. Update preclinical courses:

Both predoctoral and advanced programs instruct students and residents in preclinical exercises before they transition into the clinic. Programs need to constantly revise their preclinical exercises to keep them updated. There should be some exercises that can be eliminated or reduced in number. As an example, some prosthodontic programs might have the preclinical requirement of fabricating three crowns: one metal-ceramic, one full gold, and one lithium disilicate (press). One of these crowns or part of the procedure can be eliminated and substituted with a digital workflow (e.g. the elimination of one of the three wax-ups can be substituted with a digital abutment scanning and digital wax-up).

Another example might be related to final impressions. In some preclinical course programs, students are taking impressions on each other in order to become familiar with the different materials and techniques. In this exercise, one impression can be eliminated and the introduction of digital impression could be included. Students can scan each other with an intraoral scanner and become familiar with the digital impression systems. An online module can be used before the clinical exercise; a flipped-

classroom teaching method might be ideal for different modules of digital dentistry.

In the preclinical setting, digital scanners and evaluation software can be used as a second source of feedback to the students. Students can be trained in their first year to use the scanners in their dental anatomy course and their prosthodontics and operative course to scan a mannequin for a specific project. Again, current projects in the simulation clinic might need to be modified to include digital dentistry. For example, is it necessary for students to wax-up multiple molar teeth or can they achieve competency in the morphological characteristic of the permanent dentition by also incorporating digital technology? Course competencies should be evaluated and revised to contain digital dentistry.

G. Critical role of the Information Technology (IT) Team

The Information Technology Team (IT) must be engaged early and as a key component of the planning in support of the implementation of the needed systems. This will be unique to the systems, requirements, and staff at each institution.

Current technology in the marketplace has been largely designed for private practice, and not the complex, large-scale regulatory environments that are part of dental education and the training of hundreds of students. As a result, the IT team is critical to engage early and at a high level. While current technology is remarkable, commercial systems are still fragmented and school based environments and teams must be able to work through systems to ensure their ongoing functionality.

Consulting with the ACP, their mentors, and/or schools that have been through the implementation process is strongly advised as part of the planning, implementation, and ongoing processes of advancement.

(See Also: page 68, [How to Establish a Digital Curriculum – Digital Implementation](#) and page 70, [Business Plan](#), for important information and resources)

Predoctoral Digital Dentistry Courses

COURSE TITLE

DENTAL ANATOMY

The portion of the course described below shows the aspect of digital dentistry that could be incorporated in a dental anatomy course.

COMPETENCY STATEMENT

Students must be competent in using a digital scanner and correspondent evaluation software to analyze the quality of their work related to dental anatomy.

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Understand the value of incorporating digital technology into the course.
2. Understand the dental terminology and morphological characteristics of the permanent dentition as displayed in the digital image.
3. List the steps of using a digital scanner to scan a typodont.
4. Describe the difference between a quality scan and a scan with missing data.

SKILLS | *Students must be able to:*

1. Use a digital scanner independently to scan wax-ups from a typodont.
2. Perform self assessment and make appropriate adjustments to their anterior tooth wax-up based on faculty and digital feedback.
3. Perform self assessment and make appropriate adjustments to their posterior tooth wax-ups based on faculty and digital feedback and evaluation.
4. Apply digital technologies for improved communication with faculty and peers.
5. Develop the foundation in digital technology that can be carried out throughout other courses in the curriculum.

COURSE TITLE (CONT'D)

DENTAL ANATOMY

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	<p>LECTURE: Digital Dentistry</p> <p>ASSIGNMENT: Digital Manual</p>	Understand the value of incorporating digital dentistry into the course.
2	TBD	LAB: Digital Scanning and Evaluation Training – Part 1	Develop proficiency in the use of scanner and evaluation software.
3	TBD	OPEN LAB DEMONSTRATION AND DISCUSSION: Dental Anatomy Review including scanning and digital comparisons*	
4	TBD	LAB: Digital Scanning and Evaluation Training – Part 2	Develop proficiency in the use of scanner and evaluation software.
5	TBD	LAB: Wax-up Tooth #19	Scan wax build-up and perform digital self assessment.
6	TBD	OPEN LAB DEMONSTRATION AND DISCUSSION: Dental Anatomy Review including scanning and digital comparisons*	
7	TBD	QUIZ UNIT: Tutorial on Scanning and comparing wax-ups to the control standards*	
8	TBD	<p>LAB: Tooth #9</p> <p>EXAM: Complete the Digital Scanning and Comparison Mock Evaluation</p>	Be proficient in wax build-up of #9 and perform self assessment.
9	TBD	PRACTICAL: Competency Tooth	Summative assessment on wax build-up of #9.*

*Scanners available. Students are able to use scanner during competency exam.

COURSE TITLE**OPERATIVE DENTISTRY I AND II**

The portion of the course described below shows the aspect of digital dentistry that could be incorporated in a preclinical operative course.

COMPETENCY STATEMENT

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with tooth-supported, single-unit restorations for dentate patients.

Students must be competent in using a digital scanner and correspondent evaluation software to analyze the quality of their work as it relates to operative dentistry (e.g., onlay preparations, complex amalgams, class IV restorations).

Students must be competent in using digital technologies for the digital design and fabrication of onlay restorations.

LEARNING OBJECTIVES**KNOWLEDGE** | *Students must be able to:*

1. Understand the fundamentals, advantages, and disadvantages of digital technology.
2. Evaluate, select, and identify indications and contraindications of digital technologies and dental materials based on the best evidence available.
3. Describe the principles of preparation and design for digital restorations.
4. List the steps of complete digital workflow for patient care in the clinic.
5. Describe the cementation process for dental materials available for digitally fabricated restorations.
6. Identify, diagnose, and refer patients requiring prosthodontic rehabilitations utilizing advanced digital dentistry that is beyond the scope of didactic and clinical competency of the newly graduating general practitioner.

SKILLS | *Students must be able to:*

1. Use a digital scanner independently to scan preparations from a typodont.
2. Apply digital technologies for improved communication with faculty and peers.
3. Perform appropriate tooth preparation for digitally scanned and designed restorations.
4. Perform self assessment and make appropriate adjustments to the digital designs and preparations.
5. Design and create a milled restoration.
6. Accurately assess and modify the esthetic and functional outcomes of the restoration.
7. Demonstrate the use of a digital scanner to scan a teeth quadrant intraorally.

COURSE TITLE (CONT'D)

OPERATIVE DENTISTRY I AND II

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	<p>LECTURE: Digital Dentistry</p> <p>ASSIGNMENT: Digital Manual</p>	Understand the value of incorporating digital dentistry into the course.
2	TBD	LAB: Digital Scanning and Evaluation Training – <i>Part 1</i>	Describe the principles of preparation and design for digital restorations.
3	TBD	OPEN LAB: Operative Dentistry Review*	
4	TBD	LAB: Digital Scanning and Training – <i>Part 2</i>	Perform appropriate tooth preparation for digitally scanned and designed restorations.
5	TBD	OPEN LAB: Operative Dentistry Review*	Perform self assessment and make appropriate adjustments to the digital designs and preparations.
6	TBD	QUIZ UNIT: Digital Tutorial	Design and create a milled restoration.
7	TBD	LECTURE AND LAB	Design and create a milled restoration.
8	TBD	Digital Competency	

*Scanners available. Students are able to use scanner during competency exam.

COURSE TITLE**PRECLINICAL FIXED PROSTHODONTICS I****COURSE DESCRIPTION**

This is a preclinical course designed to provide students with instruction and experience necessary to become competent in using digital technologies for the digital design and fabrication of fixed tooth-supported restorations.

COMPETENCY STATEMENT

Students must be competent in fixed dental prosthetics including tooth preparation, imaging, designing, milling and cementing CAD/CAM restorations.

Students must be competent in designing different digital workflows for the fabrication of fixed single-unit, tooth-supported restorations.

LEARNING OBJECTIVES**KNOWLEDGE** | *Students must be able to:*

1. Describe the principles of preparation and design for all-ceramic fixed single-unit, tooth-supported restorations.
2. List the steps of complete digital workflow for fabrication of CAD/CAM restorations.
3. Describe the cementation process for dental materials available for digitally fabricated restorations.

SKILLS | *Students must be able to:*

1. Perform tooth preparations for digitally designed prostheses.
2. Perform scanning for fixed single-unit, tooth-supported restorations.
3. Perform self assessment of tooth preparations.
4. Evaluate digital models and proposed digital designs for fixed single-unit, tooth-supported restorations.
5. Make appropriate adjustments to the digital designs and final prostheses.
6. Mill and cement CAD/CAM restoration.

COURSE TITLE (CONT'D)

PRECLINICAL FIXED PROSTHODONTICS I

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	
1	TBD	ORIENTATION AND LECTURE #1: Diagnosis and Treatment Planning – Single-Unit	LAB BRIEFING: Preliminary Project LAB: Preliminary Impressions – DX Casts
2	TBD	LECTURE #2: Cores and Foundations LECTURE #3: Tooth Preparation	LAB: Preliminary Impressions – DX Casts
3	TBD	LAB BRIEFING: Project 1A	LAB: Project 1A – Pin Amalgam Core
4	TBD	LAB BRIEFING: Project 1B	LAB: Project 1B – Pre Fab Post and Core
5	TBD	LAB: Project A and B	
6	TBD	LAB BRIEFING: Project 2A – All Metal Crown	LAB: Project 2A – All Metal Prep #19 (Typodont on Bench)
7	TBD	LAB BRIEFING: Digital Scanning	LAB: Project 2A – All Metal Prep #19 (Typodont on Manikin)
8	TBD	LECTURE #4: Provisionals LAB BRIEFING: Provisionals	LAB: Project 2 – #19 Prep/Scanning/ Provisional (Methyl Methacrylate)
9	TBD	LAB: Project 2 – #19 Prep/Scanning/Provisional (Acrylic)	
10	TBD	LECTURE #9: Tissue Management and Final Impressions LAB BRIEFING: Project 3A – Posterior PFM	LAB: Project 3A – Prep/ Scanning/Provisional (Chemically Polymerized Resin) #3
11	TBD	LAB: Project 3B – Prep/Scanning/Provisional (Chemically Polymerized Resin) #12	
12	TBD	LAB: Project 3A and B	
13	TBD	LECTURE #6: Communicating with the Dental Laboratory LAB BRIEFING: Project 3C – Indirect Technique	LAB: Project 3C – Conventional Impression and Working Cast
14	TBD	LAB: Project 3C – Working Cast (Trimming Die and Mounting)	

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COURSE TITLE (CONT'D)

PRECLINICAL FIXED PROSTHODONTICS I

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	
15	TBD	LECTURE #7: Clinical Ceramics Overview LAB BRIEFING: Project 4 – Anterior PFM	LAB: Project 4A – #7 PFM Prep/Scanning/Provisional (<i>Chemically Polymerized Resin</i>)
16	TBD	LAB: Project 4B – #6 PFM Prep/Scanning/Provisional (<i>Chemically Polymerized Resin</i>)	
17	TBD	LAB: Project 4C – #8 PFM Prep/Scanning/Provisional (<i>Polycarbonate</i>)	
18	TBD	LAB: Project 4A, B, and C	
19	TBD	COMP 1: Preparation	
20	TBD	WRITTEN EXAM LECTURES 1-6: Scanning and Using Self Assessment Software for Comp 1	
21	TBD	LECTURE #8: Digital Prosthodontics LAB BRIEFING: Project 5 – All Ceramic Crowns	LAB: Project 5A – #9 All Ceramic Prep/Scanning/Provisional, Designing a Crown Digitally
22	TBD	LAB: Project 5A – #9 All Ceramic Prep/Scanning/Provisional, Designing a Crown Digitally	
23	TBD	LAB: Project 5B – #5 All Ceramic Prep/Scanning/Provisional, Designing a Crown Digitally	
24	TBD	LAB: Project 5B – #5 All Ceramic Prep/Scanning/Provisional, Designing a Crown Digitally	
25	TBD	LECTURE #9: Cements	LAB: Project 5B – #5 Milling and Cementing Crown
26	TBD	LAB BRIEFING: Ceramic Onlays	LAB: Project 6 – Ceramic Onlays
27	TBD	LAB: Project 6 – Ceramic Onlays Prep/Scanning #13 and #30	
28	TBD	COMP 2: Prep and Provisional	
29	TBD	LAB: Project 6 – Scanning and Using Self Assessment Software for Comp 2	
30	TBD	LECTURE #10: FPDs and Pontic Design	LAB: Reconfigure Typodonts, Preliminary Impressions, and DX Casts

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COURSE TITLE (CONT'D)

PRECLINICAL FIXED PROSTHODONTICS I

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC
31	TBD	LECTURE #11: Diagnosis and Tx Planning – Multi Unit LAB BRIEFING: Project 7 – FPD 18-20 LAB: Project 7A – #18-20 FPD Prep/ Scanning/Provisional
32	TBD	LAB: Project 7A – #18-20 FPD Prep/Scanning/Provisional
33	TBD	LAB #1: Project 7B – #18-20 FPD Prep/Scanning/Provisional
34	TBD	LAB #2: Project 7B – #18-20 FPD Prep/Scanning/Provisional
35	TBD	LECTURE #12: Fixed Prosthodontic Occlusion LAB: Project 8A – #3-5 FPD Prep/ Scanning/Provisional
36	TBD	LAB #2: Project 8B – #3-5 FPD Prep/Scanning/Provisional
37	TBD	LAB: Project 8A and B
38	TBD	LAB: Project 9A – #9-11 FDP Prep/Scanning/Provisional
39	TBD	LAB: Project 9B – #9-11 FDP Prep/Scanning/Provisional
40	TBD	LAB: Project 9A and B
41	TBD	COMP 3: FDP Prep and Provisional
42	TBD	LAB BRIEFING: Project 10 – Cast Post and Core: Using self assessment software for Comp 3
43	TBD	LAB: Post Pattern for Cast Post and Core
44	TBD	LAB: Post Pattern for Cast Post and Core
45	TBD	LAB BRIEFING: Project 12 – Porcelain Veneers LAB: Porcelain Veneers
46	TBD	LAB: Porcelain Veneers
47	TBD	WRITTEN EXAM

COURSE TITLE

DIGITAL FIXED PROSTHODONTICS II*Designing and milling a fixed single-unit, tooth-supported restoration.*

COURSE DESCRIPTION

This is a preclinical course designed to provide students with instructions and experience necessary to become competent in providing care using digital technologies for the digital design and fabrication of fixed single-unit, tooth-supported restorations.

COMPETENCY STATEMENT

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with fixed single-unit, tooth-supported restorations for dentate patients.

Students must be competent in designing different digital workflows for the fabrication of fixed single-unit, tooth-supported restorations.

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Understand the differences between conventional and digital workflows for fabrication of fixed single-unit, tooth-supported restorations.
2. Understand the pros and cons of conventional and digital workflows for fabrication of fixed single-unit, tooth-supported restorations.
3. Evaluate, select, and identify indications and contraindications of restorative materials for the selected digital workflow of fixed single-unit, tooth-supported restorations.
4. Understand how electronic files can be transferred from device to device in order to fabricate fixed single-unit, tooth-supported restorations (e.g., transfer of an STL file from an optical scanner to a CAD software).
5. Understand which milling systems are “open” or “closed” in order to accept and transfer electronic files from devices of different manufacturers.
6. Understand the difference between subtractive and additive technique.
7. List the steps of combining conventional and digital workflows for the design of fixed single-unit, tooth-supported restorations.
(e.g., CONVENTIONAL IMPRESSION → SCAN THE CAST → DESIGN AND MILL RESTORATION)
8. List the steps of complete digital workflow for the fabrication of fixed single-unit, tooth-supported restorations.
(e.g., DIGITAL IMPRESSION → DIGITAL MODEL → DESIGN AND MILL RESTORATION)
9. Perform self assessment and make appropriate adjustments to the digital workflows of fixed single-unit, tooth-supported restorations.

COURSE TITLE (CONT'D)

DIGITAL FIXED PROSTHODONTICS II

LEARNING OBJECTIVES

SKILLS | *Students must be able to:*

1. Identify and select the appropriate digital workflow for the fabrication of fixed single-unit, tooth-supported restorations.
2. Identify indications and limitations of digitally designed workflows for the fabrication of fixed single-unit, tooth-supported restorations.
3. Select appropriate materials for the selected digital workflows of fixed single-unit, tooth-supported restorations.
4. Transfer digital files from device to device.
5. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.
6. Create laboratory prescriptions for digitally designed fixed single-unit, tooth-supported restorations.

ASSESSMENT PLAN

MEASUREMENTS

- PRE-PATIENT CARE COURSE ASSESSMENTS
 - ▶ *Written Exams*
 - ▶ *Performance Exams*
- PATIENT EXPERIENCES
- ASSESSMENT OF DAILY CLINICAL ACTIVITY BY FACULTY
- STUDENT SELF ASSESSMENT OF DAILY CLINICAL ACTIVITY
- PATIENT-BASED DIGITAL DENTISTRY PORTFOLIO
- PATIENT REPORT
- PATIENT CARE PRESENTATION
- OSCE

COURSE TITLE (CONT'D)

DIGITAL FIXED PROSTHODONTICS II

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	<p>LECTURE: Digital Dentistry in Fixed Prosthodontics - <i>Part A</i></p> <p>ASSIGNMENT: Design a digital workflow for the fabrication of a tooth-supported fixed partial denture (#29-#31).</p>	<p>Introduction to available systems (limitations, pros and cons, and cost benefit).</p> <p>Introduction to digital workflows in Fixed Prosthodontics.</p>
2	TBD	<p>LAB: Digital Scanning and Evaluation Training (<i>Scan Typodont and Each Other</i>)</p> <p>ASSIGNMENT: Complete intraoral scan of teeth preps #29-31 (mandible, maxilla and bite).</p>	<p>Develop proficiency in the use of intra-scanner and evaluation software.</p>
3	TBD	<p>LECTURE: Digital Dentistry in Fixed Prosthodontics - <i>Part B</i></p> <p>ASSIGNMENT: Self-evaluation of their digital designed workflow.</p>	<p>Describe the principles of tooth preparation, design and material selection for digital restorations.</p>
4	TBD	<p>OPEN LAB: Digital Scanning Training</p> <p>ASSIGNMENT: Produce a digital model.</p>	<p>Develop proficiency in the use of intra-scanner and evaluation software.</p>
5	TBD	<p>LECTURE: Designing and Milling a Monolithic Fixed Partial Denture</p>	<p>List the steps of designing and milling a fixed tooth-supported restoration.</p>
6	TBD	<p>LAB: Digital Design, and Fabrication of Monolithic Teeth-Supported Fixed Partial Denture (#29-31)</p> <p>ASSIGNMENT: Digital Quality Assessment of their digital model.</p>	<p>Design and mill a tooth-supported fixed partial denture.</p>
7	TBD	<p>OPEN LAB: Digital Design and Milling of Monolithic Teeth-Supported Fixed Partial Denture (#29-31)</p> <p>ASSIGNMENT: Design and mill a monolithic tooth-supported fixed partial denture (#29-31).</p>	<p>Design and mill a tooth-supported fixed partial denture (cont'd). Perform self assessment and make appropriate adjustments to the digital designs and restoration.</p>

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COURSE TITLE (CONT'D)

DIGITAL FIXED PROSTHODONTICS II

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
8	TBD	<p>OPEN LAB: Digital Design and Milling of Monolithic Fixed Partial Denture (#29-31)</p> <p>ASSIGNMENT: Design and mill a monolithic tooth-supported fixed partial denture (#29-31).</p>	Perform self assessment and make appropriate adjustments to the digital designs and restoration.
9	TBD	LAB: Digital Photography	Understand concepts and principles of digital photography (camera settings, patient positioning, shade selection).
10	TBD	LAB: Training in Digital Photography	Develop proficiency in digital photography. Take several intraoral photographs and self-assess the quality.
11	TBD	COMPETENCY	Scan and design a tooth-supported fixed partial denture on a typodont.

COURSE TITLE

**RADIOGRAPHIC INTERPRETATION CONE BEAM
COMPUTED TOMOGRAPHY (CBCT)**

*Site evaluation and implant placement planning –
(single-unit implant crown and implant-retained overdenture).*

COMPETENCY STATEMENT

Students must be competent in reading CBCTs for evaluating edentulous sites in the maxillary and mandibular arches for adequate bone support and implant planning for a single implant crown and a two-implant retained mandibular overdenture.

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Identify normal dental anatomical landmarks on the CBCT scans.
2. Be familiar with CBCT file format and implant planning software.
3. Assess the amount of bone present in the area of concern – both width and height using the CBCT.
4. Plan restoratively driven implants on the CBCT planning software.
5. Generate CBCT surgical guides for implant placement.

SKILLS | *Students must be able to:*

1. Plan implants using CBCT for a single implant crown and implant-retained overdenture.
2. Communicate with surgical colleagues the ideal restoratively-driven implant placement.
3. Order CBCT generated surgical guides for precise implant placement.

COURSE TITLE (CONT'D)

RADIOGRAPHIC INTERPRETATION CONE BEAM COMPUTED TOMOGRAPHY (CBCT)

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE. ADDITIONAL ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	LECTURE: Digital Dental Technology Related to Implant Dentistry	Understand the overview of digital workflow for implant dentistry.
2	TBD	LECTURE: Intraoral Scanner and Laboratory Scanner	Understand the overview of digital workflow for implant dentistry.
3	TBD	LAB: Digital Scanning and Evaluation Training	Develop proficiency in the use of scanner and software.
4	TBD	LECTURE: Importance of CBCT in Implant Dentistry – Identifying Normal Anatomical Landmarks	Develop proficiency in utilizing CBCT in Implant Dentistry.
5	TBD	LAB: Hard Tissue Evaluation – Height and Width of Available Bone	Develop proficiency in utilizing CBCT in Implant Dentistry.
6	TBD	LAB: Use of Implant Planning Software in Implant Placement	Develop proficiency in utilizing CBCT in Implant Dentistry designs and preparations.

COURSE TITLE

DIGITAL DENTISTRY AND IMPLANTS

COURSE DESCRIPTION

Use of digital dentistry in diagnosis and treatment planning for single tooth implants (single implant crown and implant-retained overdenture).

COMPETENCY STATEMENT

Students must be familiar with the application of digital software and associated equipment to diagnose and treatment plan dental implants (single implant crown and implant-retained overdenture).

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Understand the basic concepts of the digital workflow and the sequencing of digital technology in implant dentistry.
2. Understand the advantages and disadvantages of using digital technology in Implant Dentistry.
3. Understand and perform preliminary assessment of the bone volume and restorative space.
4. Understand and become familiar with the virtual diagnostic wax-up.
5. Understand and be able to use the associated software and tools for digital technology in Implant Dentistry (e.g., intraoral camera, scanner).

SKILLS | *Students must be able to:*

1. Explain the concept of digital workflow and sequencing using digital technology to diagnose and treatment plan implant-supported restorations and implant-retained overdentures.
2. Identify indications and limitations of using digital technology in diagnosis and treatment planning of dental implants.
3. Design and perform virtual diagnostic wax-up.
4. Navigate and utilize the associated software and associated tools (e.g., intraoral camera, scanner).

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE. ADDITIONAL ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	LAB: Hard Tissue Evaluation – Height and Width of Available Bone	Develop proficiency in utilizing CBCT in Implant Dentistry.
2	TBD	LAB: Use of Implant Planning Software in Implant Placement	Develop proficiency in utilizing CBCT in Implant Dentistry.
3	TBD	LECTURE: Surgical Guide – Types and Importance	Understand and be able to fabricate surgical guide manually and digitally.

COURSE TITLE

PROSTHODONTIC DRIVEN IMPLANT GUIDED SURGERY*Implant placement using CBCT (Single implant crown and implant-retained overdenture).*

COMPETENCY STATEMENT

Students must be competent in selecting appropriate patients, communicating and collaborating with surgeons for computer-guided implant surgery for single-unit, implant-supported restorations and implant-retained overdentures.

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Understand the basic fundamentals and concepts of dental implant surgery and CBCT.
2. Understand the advantages and disadvantages of computer-guided and conventional implant surgery for single-unit, implant-supported restorations and implant-retained overdentures.
3. Understand the indications, contraindications, and limitations of computer-guided implant surgery for single-unit, implant-supported restorations and implant-retained overdentures.
4. Understand the differences between STL files and DICOM files, and how they can be used.
5. Understand the classification of guided surgical template based on support (teeth-supported, teeth-mucosa-supported, mucosa-supported and bone-supported).
6. Understand the protocols or steps involved in fabrication of guided surgical template for single-unit, implant-supported restorations and implant-retained overdentures.

SKILLS | *Students must be able to:*

1. Identify and select appropriate patients for computer-guided implant surgery for single-unit, implant-supported restorations and implant-retained overdentures.
2. Identify indications and limitations of computer-guided implant surgery for single-unit, implant-supported restorations and implant-retained overdentures.
3. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.

COURSE TITLE

DIGITAL SINGLE-UNIT IMPLANT RESTORATIONS

COURSE DESCRIPTION

Digital approach and workflow for fabrication of single-unit, implant-supported restorations.

COMPETENCY STATEMENT

Students must be competent in designing different digital workflows for the fabrication of single-unit, implant-supported restorations.

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Understand the differences between conventional and digital workflows for fabrication of single-unit, implant-supported restorations.
2. Understand the pros and cons of conventional and digital workflows for fabrication of single-unit, implant-supported restorations.
3. Evaluate, select, and identify indications and contraindications of restorative materials for the selected digital workflow of single-unit, implant-supported restorations.
4. Understand how electronic files can be transferred from device to device in order to fabricate single-unit, implant-supported restorations (e.g., transfer of an STL file from an optical scanner to a CAD software).
5. Understand which milling systems are “open” or “closed” in order to accept and transfer electronic files from devices of different manufacturers.
6. Understand the difference between subtractive and additive technique.
7. List the steps of combining conventional and digital workflows for the design of single-unit, implant-supported restorations.
(e.g., CONVENTIONAL IMPLANT IMPRESSION → SCAN THE CAST → CUSTOM ABUTMENT DESIGN AND MILLING → DESIGN AND MILLING OF IMPLANT CROWN)
8. List the steps of complete digital workflow for the fabrication of single-unit, implant-supported restorations.
(e.g., DIGITAL IMPRESSION → DIGITAL MODEL → CUSTOM ABUTMENT DESIGN AND MILLING → DESIGN AND MILLING OF IMPLANT CROWN)
9. Perform self assessment and make appropriate adjustments to the digital workflows of single-unit, implant-supported restorations.

SKILLS | *Students must be able to:*

1. Apply digital technologies to assessment, diagnosis, and treatment planning (e.g., CBCT, digital photos).
2. Identify indications and limitations of digitally designed and fabricated single-unit, implant-supported restorations.
3. Identify and select the appropriate digital workflow for the fabrication of single-unit, implant-supported restorations.
4. Assess, diagnose, treatment plan, and deliver digitally scanned and designed single-unit, implant-supported restorations for partially edentulous patients.
5. Perform intraoral and lab-based scanning for tooth- and implant-supported restorations.
6. Transfer digital files from device to device.
7. Evaluate digital models and proposed digital designs for single-unit restorations.

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COURSE TITLE (CONT'D)

DIGITAL SINGLE-UNIT IMPLANT RESTORATIONS

LEARNING OBJECTIVES (CONT'D)

SKILLS | *Students must be able to:*

- 8. Select an appropriate restorative material for digitally designed and fabricated restorations.
- 9. Create a laboratory prescription for digitally designed single-unit, implant-supported restorations.
- 10. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	LECTURE: Digital Dental Technology Related to Implant Dentistry	Understand the overview of digital workflow for Implant Dentistry.
2	TBD	LECTURE: Intraoral Scanner, Laboratory Scanner	Understand the overview of digital workflow for Implant Dentistry.
3	TBD	LAB: Conventional Implant Impression and Cast Fabrication Lab Scanning of the Implant Cast with Scan Body in Place	Develop competency in the use of scanner and software.
4	TBD	LECTURE: Intraoral Scanner, Laboratory Scanner – Application of Scan Bodies	Develop competency in utilizing lab and chairside scanning for Implant Dentistry.
5	TBD	LAB: Simulated Intraoral Scanning with Scan Body in Place	Develop competency in utilizing intraoral scanner for Implant Dentistry.
6	TBD	LAB: Use of Digital Design Software to Fabricate the Implant Model Transfer of File for Custom Abutment Fabrication	Develop competency in manipulating the digital scan and transferring it for custom abutment fabrication.
7	TBD	LECTURE: Design and Fabrication of Custom Implant Abutment	Understanding and be able to transfer digital file for custom abutment fabrication. Understand abutment design, finalize abutment design, and place order.

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COURSE TITLE (CONT'D)

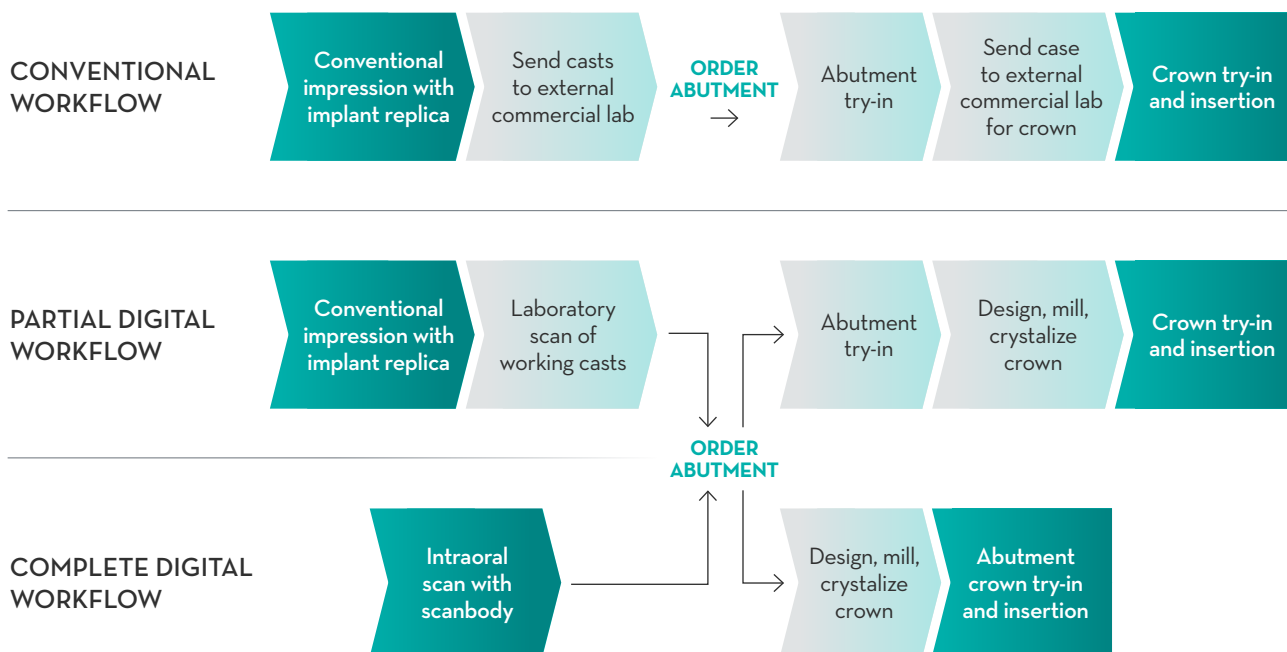
DIGITAL SINGLE-UNIT IMPLANT RESTORATIONS

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE. ADDITIONAL ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
8	TBD	LAB: Design and Fabrication of Custom Implant Abutment	Understanding and be able to transfer digital file for custom abutment fabrication. Understand and apply abutment design principles, finalize abutment design and place order.
9	TBD	LECTURE: Design and Fabrication of Final Restoration on Abutment Core File	Develop competency in navigating implant abutment and final restoration design software.
10	TBD	LAB: Design and Fabrication of Final Restoration on Abutment Core File	Develop competency in navigating implant abutment and final restoration design software.
11	TBD	LAB: Finalize Milled Restoration on the Fabricated Custom Abutment	Develop competency in navigating implant abutment and final restoration design software.
12	TBD	COMPETENCY	

IMPLANT DIGITAL RESTORATIVE WORKFLOW



COURSE TITLE**DIGITAL REMOVABLE PARTIAL DENTURES****COURSE DESCRIPTION**

Digital dentistry in diagnosis, treatment planning, and design of removable partial dentures.

COMPETENCY STATEMENT

Students must gain a fundamental background in treatment planning, scanning and designing removable partial dentures using digital software.

LEARNING OBJECTIVES**KNOWLEDGE** | *Students must be able to:*

1. Understand basic fundamentals of RPD design and properties of clasp designs in relationship to abutment teeth.
2. Understand and be able to assess height of contour of abutment teeth and soft tissue undercuts both conventionally on casts and virtually. Understand concept of tooth modification and blockout of undercuts.
3. Understand and be familiar with the virtual design of an RPD.
4. Understand the advantages and disadvantages of using digital dentistry for removable partial dentures. Be familiar with digital printing versus conventionally cast frameworks.
5. Understand and be able to use the associated software and tools for digital dentistry in removable partial dentures.
6. Understand the basic fundamentals and concepts of digital workflow.

SKILLS | *Students must be able to:*

1. Evaluate and make impressions in polyvinylsiloxane to be scanned or be able to scan intraorally. Determine that essential anatomical landmarks are captured.
2. Describe the concept of the digital workflow.
3. Diagnose, treatment plan, and sequence removable partial denture treatment using a digital workflow.
4. Identify indications and limitations of using digital dentistry to diagnose and treatment plan the removable partial dentures.
5. Design and perform a virtual RPD design.
6. Create a laboratory prescription for a digitally designed RPD.
7. Navigate and utilize the associated software and associated tools (e.g., intraoral camera, scanner).

COURSE TITLE (CONT'D)

DIGITAL REMOVABLE PARTIAL DENTURES

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	
1	TBD	ORIENTATION LECTURE #1: Components of Removable Partial Dentures	LECTURE #2: The Principles of Surveying LECTURE #3: Rests and Guide Planes
2	TBD	LAB BRIEFING: Interim RPD	LAB: Start Interim RPD
3	TBD	LECTURE #4: Major and Minor Connectors LECTURE #5: Clasps	LAB: Finish Interim RPD
4	TBD	LECTURE #6: Typodont Patient LAB BRIEFING: Clasps	LAB: Reconfigure Typodont, Preliminary Impressions and Diagnostic Casts
5	TBD	LECTURE #7: Design Sequence LAB BRIEFING: RPD Designs <i>(Students bring surveyed diagnostic casts, and red or blue pencil to the lecture hall.)</i>	LAB: Complete RPD Designs on Diagnostic Casts
6	TBD	QUIZ #2 ON LECTURES #1-7: Quiz Review LAB BRIEFING: Custom Trays	LAB: Custom Trays
7	TBD	LECTURE #8: Mouth Preparations for RPDs LAB BRIEFING: Mouth Preparations Through Completion of Patient Treatment	LAB: Mouth Preparations on Diagnostic Casts and Typodont
8	TBD	LAB: Border Molding, Final Impressions, Bead/Box Pour Master Casts, Draw Design on Master Cast	
9	TBD	LAB: Border Molding, Final Impressions, Bead/Box Pour Master Casts, Draw Design on Master Cast	
10	TBD	LECTURE #9: Biomechanics of RPD's – Applied Dental Materials for RPD LAB BRIEFING: Work Authorizations – <i>(Bring Designed Casts and Red/Blue Pencils)</i>	LAB: Completion of Typodont Patient

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COURSE TITLE (CONT'D)

DIGITAL REMOVABLE PARTIAL DENTURES

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	
11	TBD	LAB BRIEFING: Design Projects on Paper and Presentation of Design Tutorial (<i>Project Handouts</i>)	LARGE GROUP SEMINAR: RPD Design in the Lecture Hall
12	TBD	SMALL GROUP SEMINARS: RPD Design in the Lecture Hall, Different Examples of Kennedy Class I and II	
13	TBD	SMALL GROUP SEMINAR: Design on Paper Project, Different Examples of Kennedy Class III and IV	
14	TBD	LECTURE #10: Digital Dentistry in Removable Partial Dentures BRIEFING: Scan the Cast and RPD Design Treatment	LAB: Familiarize with Scanner and Scan Casts LAB: Familiarize with Scanner and Scan Casts
15	TBD	LAB: Evaluate the 3D Images of Scans and Survey, Tripod Digital Model, Place Bead Lines (<i>Check for undercuts and blockout.</i>)	
16	TBD	LAB: Design Retention for Edentulous Areas and Major Connectors (<i>Design optimal clasp assemblies, minor connectors, and add or remove material to smooth surfaces.</i>)	
17	TBD	LAB: Add Support Bars for Manufacturing, Complete Work Authorization, and Submit for Fabrication	
18	TBD	FINAL DIDACTIC EXAM	LAB: First Practical Examination
19	TBD	LAB: First Clinical Cast	
20	TBD	LAB: Second Clinical Cast	
21	TBD	LAB: Third Clinical Cast	
22	TBD	LAB: Completion of Clinical Casts	
23	TBD	LAB: Scan Maxillary Cast, Survey, Tripod and Block Out Undercuts	
24	TBD	LAB: Laboratory Practical Examination #2	

COURSE TITLE

DIGITAL COMPLETE DENTURES

COURSE DESCRIPTION

Use of digital dentistry in fabrication of complete denture prostheses for completely edentulous patients.

COMPETENCY STATEMENT

Students must be competent in assessment, diagnosis, and treatment planning for fabrication of complete dentures digitally.

LEARNING OBJECTIVES

KNOWLEDGE | *Students must be able to:*

1. Understand the fundamentals of fabrication of conventional complete dentures in terms of support, retention, and stability.
2. Understand the concepts of obtaining maxillomandibular relationship record in terms of centric relation and vertical dimension occlusal.
3. Understand the concept of esthetics and phonetics in relationship to placement of denture teeth.
4. Understand the advantages and disadvantages of fabrication of digital dentures. Be able to identify and diagnose patients requiring preprosthetic surgery and limitations of digital dentures (such as immediate dentures).
5. Be able to list the steps of the digital workflow for fabrication of digital dentures.
6. Understand and be able to describe the insertion process for digitally fabricated dentures.

SKILLS | *Students must be able to:*

1. Evaluate and make impressions in polyvinylsiloxane for scanning or be able to scan intraorally. Determine that essential anatomical landmarks are captured.
2. Determine that buccal/labial contours, proper occlusal vertical dimension, occlusal plane with virtual reality capability or materials are provided by the digital company.
3. Create laboratory prescriptions for a digitally designed removable prostheses.
4. Assess and modify digital designs if trial dentures are available.
5. Insert finished prostheses and assess clinical outcomes.

ASSESSMENT PLAN

MEASUREMENTS

- PRE-PATIENT CARE COURSE ASSESSMENTS
 - ▶ *Written Exams*
 - ▶ *Performance Exams*
- PATIENT EXPERIENCES
- ASSESSMENT OF DAILY CLINICAL ACTIVITY BY FACULTY
- STUDENT SELF ASSESSMENT OF DAILY CLINICAL ACTIVITY
- PATIENT-BASED DIGITAL DENTISTRY PORTFOLIO
- PATIENT REPORT
- PATIENT CARE PRESENTATION
- OSCE

COURSE TITLE (CONT'D)

DIGITAL COMPLETE DENTURES

COURSE SCHEDULE

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
1	TBD	LECTURE: Introduction to Edentulous Anatomy	Review of anatomy in relation to retention, stability and support of complete dentures.
2	TBD	LECTURE: Review Recorded Lectures Before Class: 1. <i>Edentulous Anatomy</i> 2. <i>Preprosthetic Surgery</i> 3. <i>ACP Classification</i> LAB: Review Anatomy on Each Other	Review ACP classification system for complete edentulism including anatomical factors that warrant preprosthetic surgery.
3	TBD	LECTURE: Review Recorded Lectures Before Class: 1. <i>Complete Denture Procedures</i> 2. <i>Preliminary Impression Custom Tray</i>	Discuss proper selection of trays and evaluation of clinically acceptable diagnostic impressions.
4	TBD	LAB: A. Preliminary Impression (<i>mannequin</i>) B. Custom Tray	Proper evaluation of vestibular anatomy of maxillary and mandibular arches and sequential techniques for fabrication of custom trays.
5	TBD	LECTURE: Border Molding and Final Impressions	Proper evaluation of custom trays and review of proper border molding procedures for maxilla and mandible.
6	TBD	LAB: A. Custom Tray B. Preliminary Impression (<i>mannequin</i>)	
7	TBD	LECTURE: Bead, Box, Pour Master Casts, Record Bases and Wax Rims	Review necessity for properly poured master casts and occlusal rims, as well as the sequential techniques for fabrication of master casts and occlusal rims for the fabrication of complete dentures.
8	TBD	PRACTICAL EXAM: Custom Trays	

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COURSE TITLE (CONT'D)

DIGITAL COMPLETE DENTURES

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
9	TBD	<p>LECTURE: MMR</p> <ul style="list-style-type: none"> ▶ Maxillomandibular Relations ▶ Anterior Tooth Selection ▶ Posterior Palatal Seal 	<p>Review the following:</p> <ol style="list-style-type: none"> 1. Contouring of occlusal rims, determination of vertical dimension of occlusion, and proper recording of centric record. 2. Criteria for selection of anterior tooth selection for the edentulous patients. 3. Techniques and timing for developing posterior palatal seal on master casts.
10	TBD	<p>LECTURE: Complete Denture Occlusion</p>	<p>Historical review of complete denture occlusion in relation to cusp design and force vectors, review of Hanau’s Quint relationship, balanced versus non-balanced occlusion and review of various types of posterior teeth and selection of posterior teeth based on occlusal schemes. Review of sequential techniques for setting anterior and posterior teeth for a class I anatomical complete denture occlusion.</p>
11	TBD	<p>LAB:</p> <ul style="list-style-type: none"> A. Border Mold (mannequin) B. Bead, Box, Pour Maxillary 	
12	TBD	<p>LAB:</p> <ul style="list-style-type: none"> A. Border Mold (mannequin) B. Bead, Box, Pour Mandibular 	
13	TBD	<p>LECTURE: Introduction to Digital Dentures</p>	<p>Introduction to standards and principles of CAD/CAM for complete dentures in treatment of uncomplicated completely edentulous patient.</p>
14	TBD	<p>CLINIC: Digital Dentistry – Border Molding and Final Impressions in PVS on Patient</p>	<p>Be able to evaluate that essential anatomical landmarks are captured.</p>

(Continues on next page)

COURSE TITLE (CONT'D)

DIGITAL COMPLETE DENTURES

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
15	TBD	CLINIC: Digital Dentistry – Jaw Relations Records	Be able to create a prescription for digital dentures and evaluate proper occlusal plane, and occlusal vertical dimension, and make proper centric relation records using Anatomical Measuring Device (AMD) and a Gothic Arch Tracing (GAT).
16	TBD	QUIZ #2: Clinical Try-In ▶ <i>Complete Denture Occlusion (Continued)</i> ▶ <i>Clinical</i>	Sequential evaluation of trial dentures in terms of phonetics, esthetics, and discrepancy in occlusal vertical dimension. Review how to diagnose potential problems and how to correct them.
17	TBD	LAB: A. Record Bases and Wax Rims B. PRACTICAL EXAM –Bead, Box, Pour	
18	TBD	MIDTERM	
19	TBD	LAB: Occlusal Record Taking	
20	TBD	LAB: A. PRACTICAL EXAM –Bead, Box, Pour B. Record Bases and Wax Rims	
21	TBD	LECTURE: Review Recorded Lectures Before Class: 1. <i>Laboratory Processing</i> 2. <i>Molecular Chemistry of Acrylic Festooning</i> 3. <i>Insertion of Complete Dentures</i>	Review sequential clinical and laboratory techniques for insertion of complete dentures. Review concepts of remount jig, laboratory and clinical remount and equilibration of complete dentures. Review use of pressure indicator paste and disclosing wax for evaluation of overcompression and overextension of the intaglio surface and borders of complete denture base.

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COURSE TITLE (CONT'D)

DIGITAL COMPLETE DENTURES

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
22	TBD	LAB: A. PRACTICAL EXAM: Record Bases and Occlusal Rims B. MMR	
23	TBD	LAB: A. MMR B. PRACTICAL EXAM: Record Bases and Occlusal Rims	
24	TBD	LECTURE: Post-Op Insertion Visit Reline/Rebase/Repair	Review signs and symptoms related to post-insertion problems and how to correct these problems. Description of indications for relining and rebasing complete dentures.
25	TBD	CLINIC: Digital Dentistry – Try-In	Be able to evaluate buccal/labial contours and verify proper placement of teeth and occlusal vertical dimension.
26	TBD	LECTURE: Review Recorded Lectures Before Class: 1. Selective Equilibration 2. Laboratory Set-Up Mount Casts Clinical Dentures	Review rules for equilibration and sequential techniques for equilibration of complete dentures.
27	TBD	LECTURE: Immediate Dentures	Review descriptions of classic immediate, and transitional immediate dentures. Discuss the advantages and disadvantages of immediate dentures and the cases in which they are warranted. Review sequential technical steps for set-up of transitional immediate dentures.
28	TBD	LAB: Set-Up Anterior Teeth <i>(In class together)</i>	
29	TBD	LAB: Set-Up Posterior Teeth <i>(In class together)</i>	

(Continues on next page)

COURSE TITLE (CONT'D)

DIGITAL COMPLETE DENTURES

COURSE SCHEDULE (CONT'D)

THE FOLLOWING FRAMEWORK IS PROVIDED AS A SAMPLE COURSE SCHEDULE.
ADDITIONAL GOALS AND ASSIGNMENTS CAN BE IMPLEMENTED BASED ON INSTITUTIONAL PRIORITIES.

SESSION	TIME	TOPIC	GOALS
30	TBD	LECTURE: Implant Overdenture	Introduction to implant overdentures and review of sequential course of treatment.
31	TBD	CLINIC: Digital Dentures – Insertion	Be able to insert dentures by evaluating fit of intaglio surface, evaluating cameo surface by examining functions of phonetics and swallowing, and adjusting for proper occlusion.
32	TBD	CLINIC: Digital Dentures – Post Insertion Adjustment	Be able to diagnose etiology of various post-insertion problems and know proper procedures to correct the associated problems.
33	TBD	LAB: Denture Set-Up <i>(In class together)</i>	
34	TBD	LAB: Finish Denture Set-Up	
35	TBD	LECTURE: Complete Denture Patient	Review of fabrication of complete dentures from clinical appointments through laboratory steps. Review writing laboratory prescriptions.
36	TBD	FINAL REVIEW: Small Groups	
37	TBD	FINAL PRACTICAL: Patient Scenario	
38	TBD	FINAL WRITTEN EXAM	

COURSE TITLE

CLINICAL DIGITAL DENTISTRY

COURSE DESCRIPTION

Students will receive the instruction and experience necessary to become competent in providing care using digital technologies for dentate and partially edentulous patients. Students will also be able to describe available digital techniques for single-unit restorations of teeth and dental implants. Finally, students will be able to collaborate with a digital technician for these types of restorations and properly implement the referral process for more complex patient scenarios.

Students will apply the principles of digital dentistry to the level of competence in the treatment of patients, including:

- Assessment, diagnosis and treatment planning
- Digital radiographic assessment including CBCT
- Indirect inlay and onlay restorations
- Single-unit, tooth-supported restorations
- Single-unit, implant-supported restoration
- Removable as defined by the institution

The clinical workflow will occur in the digital clinic and will be managed and overseen by the identified faculty and staff. A Digital Designer will assist the students and faculty with the digital workflow, file transfers, restoration design and production. This will include same day restorations, as well as restorations subsequently fabricated digitally either in-house or with associated dental laboratories.

COMPETENCY STATEMENT

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies for dentate, partially edentulous, and completely edentulous patients.

COMPETENCY I
Single-Unit, Tooth-Supported Restoration

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with tooth-supported single-unit restorations for dentate patients.

COMPETENCY II
Single-Unit, Implant-Supported Restoration

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with implant-supported, single-unit restorations for partially edentulous patients.

COMPETENCY III
Single-Unit Restoration

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with tooth- and implant-supported, single-unit restorations for dentate and partially edentulous patients.

COMPETENCY IV
Removable Protheses

Students must be competent in the assessment, diagnosis, treatment planning, and application of digital technologies with removable protheses for partially and completely edentulous patients.

COURSE TITLE (CONT'D)

CLINICAL DIGITAL DENTISTRY

LEARNING OBJECTIVES – FIXED RESTORATION

KNOWLEDGE | *Students must be able to:*

1. Understand the fundamentals of digital technology.
2. Evaluate, select, and identify indications and contraindications of digital technologies and dental materials based on the best evidence available.
3. Describe the principles of preparation and design for digital restorations.
4. List the steps of complete digital workflow for patient care in the clinic.
5. Describe the cementation process for dental materials available for digitally fabricated restorations.
6. Identify, diagnose, and refer patients requiring prosthodontic rehabilitations utilizing advanced digital dentistry that is beyond the scope of didactic and clinical competency of the newly graduating general practitioner.

SKILLS | *Students must be able to:*

1. Identify indications and limitations of digitally designed and fabricated single-unit restorations.
2. Assess, diagnose, treatment plan, and insert single-unit digitally designed restorations for dentate and partially edentulous patients.
3. Perform self assessment using digital technology to evaluate wax-ups, preparations, and provisional restorations.
4. Perform appropriate preparations for digitally designed restorations.
5. Perform intraoral and extraoral scanning for tooth- and implant-supported restorations.
6. Evaluate digital models and proposed digital designs for single tooth restorations.
7. Perform self assessment and make appropriate adjustments to the digital designs, preparations, and final restorations.
8. Create a laboratory prescription for single-unit digital restorations.
9. Select an appropriate restorative material for digitally designed and fabricated restorations.
10. Accurately assess and modify the esthetic and functional outcomes of treatment at completion of therapy and at periodic intervals.
11. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.

LEARNING OBJECTIVES – REMOVABLE

KNOWLEDGE | *Students must be able to:*

1. Understand the fundamentals of digital technology.
2. Evaluate, select, and identify indications and contraindications of digital technologies and dental materials based on the best evidence available.
3. Describe the principles of preparation and design for removable digital prostheses.
4. List the steps of complete digital workflow for patient care in the clinic.
5. Describe the insertion process for digitally fabricated removable prostheses.
6. Identify, diagnose, and refer patients requiring prosthodontic rehabilitations utilizing advanced digital dentistry that is beyond the scope of didactic and clinical competency of the newly graduating general practitioner.

COURSE TITLE (CONT'D)

CLINICAL DIGITAL DENTISTRY

LEARNING OBJECTIVES – REMOVABLE (CONT'D)

SKILLS | *Students must be able to:*

1. Identify indications and limitations of digitally designed and fabricated removable prostheses.
2. Assess, diagnose, treatment plan, and deliver digitally designed removable prostheses for partially and completely edentulous patients.
3. Perform appropriate tooth preparations for digitally designed prostheses (e.g., removable partial dentures).
4. Perform intraoral and extraoral scanning for removable prostheses.
5. Evaluate digital models and proposed digital designs for removable prostheses.
6. Perform self assessment and make appropriate adjustments to the digital designs and final prostheses.
7. Create laboratory prescriptions for a digitally designed removable prostheses.
8. Select appropriate restorative materials for digitally designed and fabricated removable prostheses.
9. Accurately assess and modify the esthetic and functional outcomes of treatment at completion of therapy and at periodic intervals.
10. Apply digital technologies for communication and collaboration while understanding compliance issues in digital transfer of files and patient information.

ASSESSMENT PLAN

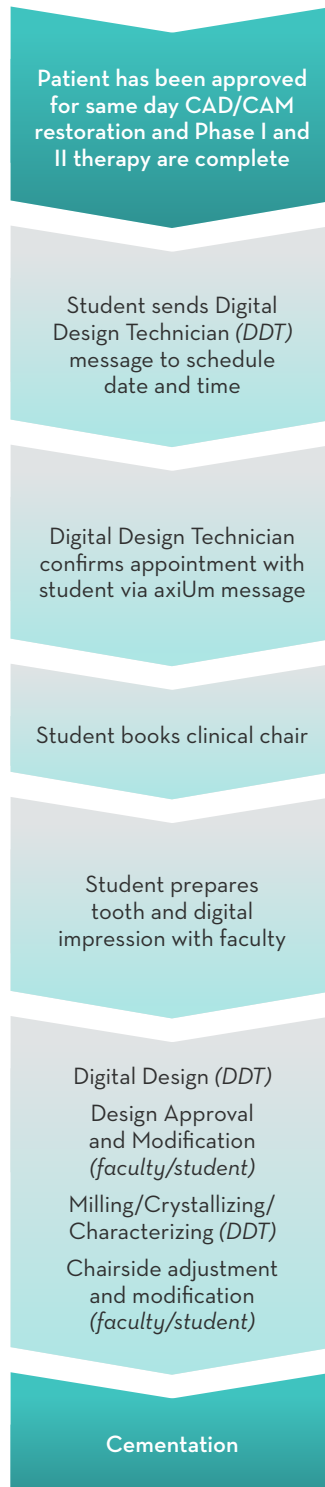
MEASUREMENTS

- PRE-PATIENT CARE COURSE ASSESSMENTS
 - ▶ *Written Exams*
 - ▶ *Station Exams*
 - ▶ *Performance Exams*
 - ▶ *Self Assessment*
- PATIENT EXPERIENCES
- ASSESSMENT OF DAILY CLINICAL ACTIVITY BY FACULTY
- STUDENT SELF ASSESSMENT OF CLINICAL ACTIVITY
- PATIENT-BASED DIGITAL DENTISTRY PORTFOLIO (*tooth-, implant-, and tissue-supported digital prostheses*)
- PATIENT REPORT (*log of all digital patient therapy*)
- PATIENT CARE PRESENTATION (*tooth-, implant-, and tissue-supported digital prostheses*)
- OSCE

COURSE TITLE (CONT'D)

CLINICAL DIGITAL DENTISTRY

SINGLE-UNIT FIXED DENTAL PROSTHESIS –
CLINICAL WORKFLOW

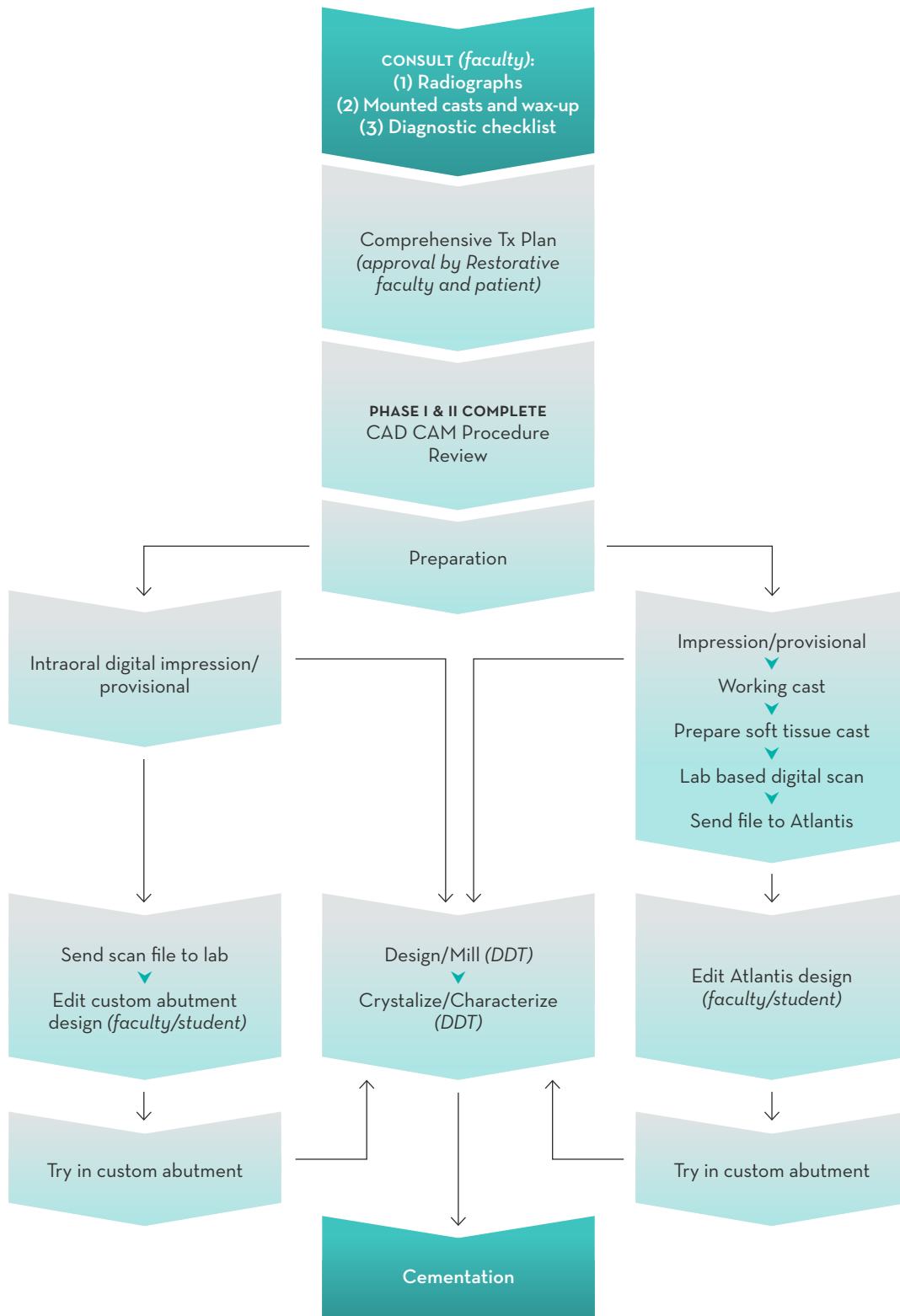


COURSE TITLE (CONT'D)

CLINICAL DIGITAL DENTISTRY

SINGLE-UNIT FIXED DENTAL PROsthESIS – IMPLANT SUPPORTED

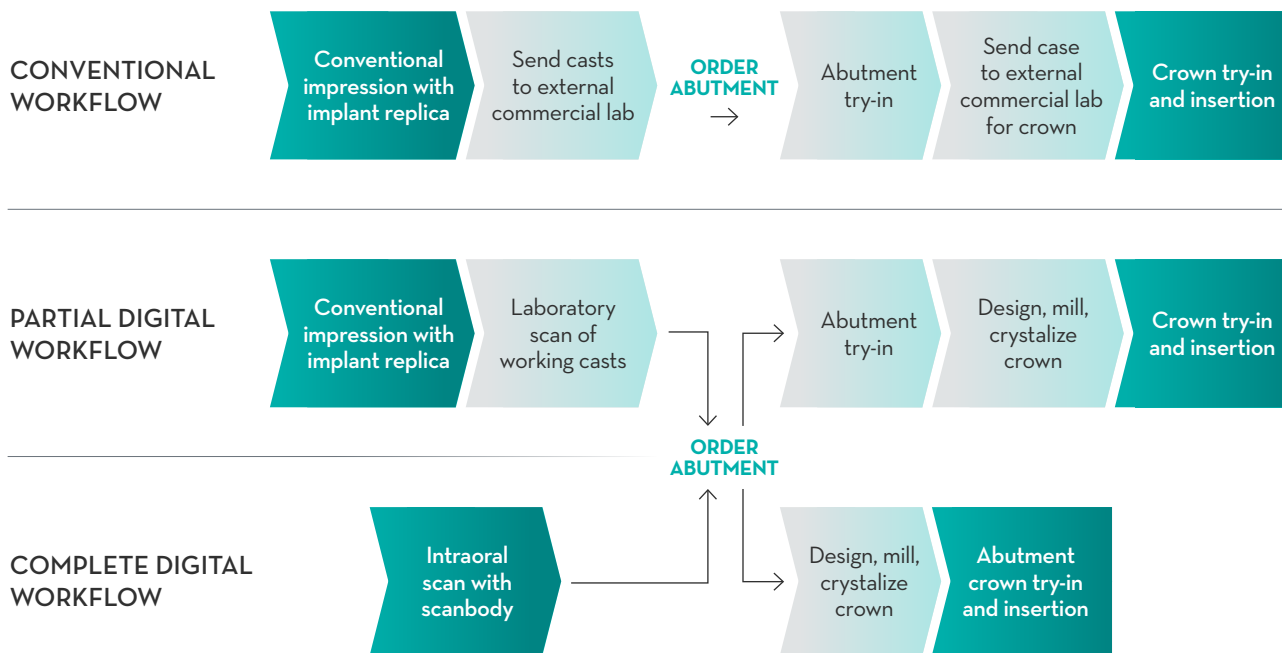
CLINICAL PROCEDURE OVERVIEW



COURSE TITLE (CONT'D)

CLINICAL DIGITAL DENTISTRY

IMPLANT DIGITAL WORKFLOW



2 Appointment custom abutment and final restoration insertion

axiUm Digital Procedure Codes

It is recommended that changes in the axiUm procedure codes be made to allow tracking and monitoring of the scope and numbers of procedures being planned and completed digitally.

ALL USER GROUPS

Undergrad (UG)
Postgrad (PG – Specialty Programs)
Faculty (Faculty GP and specialty codes and fees)

DESIGNATION

DD – Denotes a digital workflow for restoration design and fabrication

CONSULTATION CODE

DD9351	Digital	Prosthodontics Consultation
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CERAMIC CROWN ON TEETH (2740)

Same fee as standard all-ceramic crown fees

DD2740	Crown	Porcelain/ceramic subs
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WITH THE STEP CODES:

DD2740A	Digital	Initial preparation
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DD2740B	Digital	Scan and design
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DD2740C	Digital	Scan and design
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CERAMIC CROWN ON IMPLANTS (6058, 6065, 6057, ABUTMENT)

Same fee as standard all-ceramic crown fees for restorations on implants

DD6057	Digital	Custom abutment
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WITH THE STEP CODES:

DD6057A	Digital	Initial preparation
---------	---------	---------------------

DD6057B	Digital	Scan and design
---------	---------	-----------------

DD6057C	Digital	Insertion
---------	---------	-----------

DD6058	Digital	All porcelain/ceramic crown on abutment
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WITH THE STEP CODES:

DD6058A	Digital	Initial preparation
---------	---------	---------------------

DD6058B	Digital	Scan and design
---------	---------	-----------------

DD6058C	Digital	Insertion
---------	---------	-----------

DD6065	Digital	All ceramic crown directly on implant
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WITH THE STEP CODES:

DD6065A	Digital	Initial preparation
---------	---------	---------------------

DD6065B	Digital	Scan and design
---------	---------	-----------------

DD6065C	Digital	Insertion
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STUDENT NAME _____ PATIENT NAME _____
 AXIUM NUMBER _____ TOOTH NUMBER _____ DATE _____

Diagnostic Checklist

PREDOCTORAL DIGITAL DENTISTRY – SINGLE-UNIT FIXED PROSTHESES

Patient’s dental record is complete <i>All appropriate forms in the axiUm EHR are completed and approved.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Medical history has been reviewed and is current	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Patient is ASA Class I, II, or III	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Psychosocial considerations <i>Patient expectations are conducive to successful restorative therapy. Patient has no major psychological conditions.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Periapical and panoramic radiographs are current	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Stable occlusal relationship <i>Present with adequate posterior support (at least two occluding pairs of teeth bilaterally).</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
No symptoms of TMD, parafunctional habits, or significant wear	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Remaining tooth structure is adequate to support the planned restoration and provide adequate retention/resistance form	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Supra or equigingival finish line placement is possible and anticipated	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Interocclusal spacing <i>Adequate restorative space exists for a milled restoration after occlusal reduction – 2mm.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
M-D restorative width <i>For full-coverage crowns a minimum of 7mm is needed. Maximum M-D restorative width is 10mm for molars.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
An adequate diagnostic cast and wax-up have been fabricated	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Maximum mouth opening (MMO) <i>Adequate for intraoral digital or traditional final impression</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Ceramic is a suitable material choice for the selected site <i>For example, ceramic should not be used to restore portions of teeth that will incorporate an RPD clasp assembly.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Shade selection <i>Available in monolithic ceramic blocks.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Provisional restoration recommended	<input type="checkbox"/> YES	<input type="checkbox"/> NO
Excluded teeth <i>The area(s) to be restored are NOT one of the following: #1, 2, 15, 16, 17, 18, 23-26, 31, 32.</i>	<input type="checkbox"/> YES	<input type="checkbox"/> NO
No more than two adjacent units and no more than one unit for same-day restoration	<input type="checkbox"/> YES	<input type="checkbox"/> NO

ATTENDING SIGNATURE FOR ALL TOOTH-SUPPORTED DIGITAL RESTORATIONS (INSTRUCTOR MUST APPROVE DIAGNOSTIC WAX-UP)

SIGNATURE _____ DATE _____

Predoctoral Digital Dentistry Philosophy for Single-Unit Fixed Dental Prostheses

DIAGNOSIS AND TREATMENT PLANNING

A comprehensive oral evaluation and treatment plan must be completed for every patient planned for digital dental treatment. *The initial step in this process is a consultation appointment for tooth-supported restorations in the clinic.*

1. Required pretreatment records for consultation appointment:

- EHR forms: medical history, dental history, intraoral and extraoral head and neck evaluation, caries risk assessment, periodontal evaluation, pulp vitality testing diagnosis, occlusal evaluation, and Prosthodontic Diagnostic Index.
- Panoramic and current periapical radiograph of tooth to be restored.
- Digital diagnostic checklist and evaluation.
- Mounted diagnostic cast with wax-up of tooth/teeth to be restored.

2. If the patient is accepted for a CAD/CAM milled restoration at the predoctoral level, the faculty will sign the Digital Diagnostic Checklist.

The CAD/CAM milled restoration should be incorporated in the comprehensive treatment plan and signed by the restorative faculty in the general clinics. If the patient needs phase I and II therapy, the student will proceed with this treatment then return to the clinic for the CAD/CAM restorations.

3. A new consultation when ready to proceed with the digital restoration in the clinic.

4. Prior to the final preparation/scanning appointment, the following must be completed and reevaluated by the applicable department:

- Disease Control
- Endodontic treatment
- Periodontal treatment
- Oral surgery treatment
- Orthodontic treatment

5. The CAD/CAM restoration will be completed in the clinic under faculty supervision assigned to those clinics.

Students will present to the preparation/scanning appointment a duplicate cast of the diagnostic wax-up, as well as a vacuum-formed matrix or a PVS putty. This will be used as a preparation reduction guide and to fabricate a provisional restoration if the definitive restoration cannot be milled on the same day. After preparation, the faculty will recommend either an intraoral digital or a conventional final impression.

6. Students are responsible for diagnosis and treatment planning, preparation, conventional and chairside digital impression making, working cast preparation, adjustment, and cementation of the CAD/CAM restoration.

7. The Digital Design Technician is responsible for designing, milling, crystallizing and characterizing the CAD/CAM restoration.

When the patient arrives at the clinic, they should be checked in the axiUm system so that the Digital Design Technician knows that the patient has arrived. Once the student has completed the digital impression for tooth-supported restorations, and the faculty has approved it, the student will notify the Digital Design Technician, via axiUm message, that the restoration is ready to be designed. Once the design is complete, the student must show the faculty the design and obtain approval from that faculty before the restoration can be milled. The faculty will notify the technician via axiUm message that the restoration can be milled.

8. For implant-supported digital restorations, the student must take an implant level impression in the Restorative Implant Clinic. Once the Restorative Implant Clinic faculty approves the impression, the student is responsible for creating the soft tissue cast. The student will mount the casts on a semi-adjustable articulator, and give the mounted casts to the Digital Design Technician. The technician will complete a lab-based scan of the soft tissue and opposing cast and send the file to the laboratory. The student will edit the abutment design with their faculty. When the custom abutment arrives at the school, the student will try the abutment intraorally. If the finish line of the custom abutment is modified at try-in appointment, the corresponding restoration will not be fabricated through in-house production. Once the abutment is approved by the faculty, the student will proceed to contact the Digital Design Technician in the manner previously described (step 7).

9. If a CAD/CAM tooth-supported restoration is planned to be milled the same day as scanning, the student must first schedule the appointment with the Digital Design Technician. It is necessary for these appointments to begin at 9:30am and continue until 4:30pm. The student will be responsible for sending an axiUm message to the technician to set up an appointment date and time. The technician will confirm the appointment via axiUm message. The student will then book a chair in the clinic. If the Digital Design Technician is not aware of a scheduled appointment, the CAD/CAM restoration will NOT be milled the same day as the scan. If anything changes with the schedule, or the patient cancels, the student must notify the Digital Design Technician and the faculty as early as possible. This can be accomplished by axiUm message, email, or in person.

REFERRAL FOR DIGITAL DENTISTRY

During the comprehensive oral evaluation appointment in the undergraduate clinic, every tooth that is treatment planned for a direct or indirect restoration should be considered for a CAD/CAM restoration. The following general indications or contraindications should be followed to assess if a CAD/CAM restoration is recommended:

INDICATIONS	CONTRAINDICATIONS
Stable occlusal relationship with at least two occluding pairs of teeth bilaterally	Unstable occlusion
Adequate tooth structure remains (3mm height in anterior, 4mm height in posterior)	Inadequate tooth structure remains, inadequate height or walls entirely missing
Finish line is mostly supra- or equigingival and largely on enamel	Finish line is subgingival or largely on dentin/cementum
Proper retention and resistance features are achievable without undercuts	Little to no retention and resistance features and/or moderate undercuts present
Shade selection and matching is possible with monolithic ceramic blocks using external characterization	Shade has great variation present or is not available in stock
Adequate interocclusal and mesiodistal space is present	Restorative space is not present for adequate material thickness
Ceramic is an appropriate restorative material for the specific tooth/site	Allergy to the material

***The above list is not inclusive of all indications and contraindications. For a more complete list, see the Digital Dentistry Diagnostic checklist.*

REFERRAL FOR DIGITAL DENTISTRY (CONT'D)

If the patient meets the indications for a CAD/CAM restoration, the patient should be screened in the clinic for tooth-supported restorations and for implant-supported restorations. This must occur PRIOR to finalizing the treatment plan. If the patient is approved for a CAD/CAM restoration, the student will present the signed Digital Dentistry Diagnostic Checklist to the restorative faculty member in the undergraduate clinic. The CAD/CAM restorations should be included in the patient's comprehensive treatment plan. This treatment plan should be approved by the restorative faculty member in the undergraduate clinic and signed by the patient prior to treatment initiation.

CAD/CAM restorations should be initiated in the clinic following phase I and II therapy.

SHADE SELECTION

Shade selection should be accomplished at the beginning of the appointment prior to tooth desiccation. The appropriate CAD shade guide and multiple light sources, including daylight, are used to select the shade. Selected shade for the final restoration should be recorded in the patient's record. The same shade should, if possible, be used for the provisional restoration (if needed) to allow for evaluation and patient satisfaction. The shade should be verified at subsequent appointments.

TOOTH PREPARATION PRINCIPLES, MARGIN DESIGN, AND SELECTION OF RESTORATIVE MATERIALS FOR CAD/CAM

All restorative patient care will occur within the clinic for tooth-supported restorations and for implant-supported restorations. The diagnostic assessment and treatment plan must be reviewed with a faculty in advance of any restorative treatment appointments. ***Students must work with the same faculty for all steps involved in fabrication of all fixed restorations.*** The steps include: initial preparation of tooth/teeth, provisionalization as needed, final impression and intraoral scan, digital restoration design, milling, characterization, try-in, and final cementation.

Teeth preparation must be designed to exhibit the following characteristics: 10-20 degrees of total occlusal convergence, a minimal occlusocervical dimension of 4mm for molars and 3mm for other teeth. All line angles must be well-rounded, keeping in mind that the milling machines frequently use burs with tip diameters of 1mm or more. Axial wall reduction, occlusal reduction, finish line and

margin type selection should be based on the type of crown and esthetic requirements. For all CAD/CAM restorations on natural teeth, regardless of the restoration design, the finish line must be equigingival or supragingival for the purpose of scanning and bonding.

PREPARATION DESIGNS

INLAY

- All carious occlusal fissures and defects included
- Cavosurface margins should have well-defined edges for easy identification
- *Occlusal reduction*: 2.0mm



- *Internal axial walls*: 6-10° taper
- Buccal and lingual vertical walls of occlusal and interproximal box are divergent 12-20°
- Well rounded internal line angles
- *Interproximal flare*: 100-120°
- *Isthmus width*: minimum of 1.5-2.0mm
- *Isthmus depth*: >1.5mm

ONLAY

- All carious occlusal fissures and defects included
- Cavosurface margins should have well-defined edges for easy identification
- *Occlusal reduction*: 2.0mm
- Centric cusps uniformly reduced with 2.0mm clearance with the opposing teeth
- Rounded shoulder or deep chamfer placed on centric cusp
- Non-centric cusps uniformly reduced with 2mm clearance with the opposing teeth

- *Internal axial walls*: 6-10° taper
- Buccal and lingual vertical walls of occlusal and interproximal box are divergent 6-10°
- Well rounded internal line angles
- *Interproximal flare*: 100-120°
- *Isthmus width*: minimum of 1.5-2.0mm
- *Isthmus depth*: >1.5mm

ALL-CERAMIC CROWN POSTERIOR

- *Occlusal reduction*: 2.0mm clearance with opposing teeth
- *Axial reduction*: 1.25-1.5mm
- *Finish line*: 1mm, rounded shoulder or deep chamfer 360 degrees circumferentially.
- Well rounded internal line angles

ALL-CERAMIC CROWN ANTERIOR

- *Incisal reduction*: 2.0mm
- *Axial reduction*: 1.5mm
- *Finish line*: 1mm, rounded shoulder or deep chamfer all around
- 6-10° taper
- Preparation should follow three plane reduction based on natural anatomical shape

PROVISIONALIZATION

1. *Any tooth requiring an extracoronal fixed dental prosthesis that cannot be milled the same day as tooth preparation, must receive a custom fabricated provisional based upon a diagnostic wax-up.* The provisional must be made with an autopolymerizing resin or Bis-acryl resin. The provisional restoration must provide a trial stage for the final restoration in terms of function, contour and esthetics. The ideally contoured provisional restoration must also be used to evaluate the adequacy tooth preparation.
 - e. Permit normal function of the masticatory system by restoring occlusion
 - f. Maintain patient's normal occlusion or establish proper occlusal contacts
 - g. Easily reline after preparation modifications
 - h. Maintain and promote soft tissue health
 - i. Provide proper anatomy and color
2. *Provisional restoration must satisfy the following requirements:*
 - a. Cover exposed dentin in order to protect the pulp from chemical, bacterial, and thermal irritation
 - b. Maintain periodontal health: good margins, contour, and non-irritating surface texture
 - c. Prevent tooth fracture
 - d. Maintain the position of prepared teeth and prevent extrusion of opposing teeth
3. *Provisionalization methods include: PVS Putty, Shell, and vacuum-formed matrix.*
4. *The following cements should be used for provisional restorations:*
 - a. Zinc oxide-based cements without eugenol
 - b. Polycarboxylate cements may be used in some situations for non-retentive provisionals, or for longer term provisionalization while other therapy (e.g. periodontology) is being completed.
 - c. Spot etching and bonding for inlay and onlay provisionals

IMPRESSION MAKING AND TISSUE RETRACTION FOR CONVENTIONAL FINAL IMPRESSIONS

Conventional impressions for tooth-supported restorations will be taken in situations where the final restoration will not be able to be fabricated during the same appointment. This will be determined by the faculty. Lab-based scanning will be used, and the Digital Design Technician will design, mill, and crystalize the restoration in-house.

1. *The previously selected shade of the final restoration must be verified at the beginning of the appointment before the final impression is made, using the appropriate shade guide.*
2. *Final impression for indirect restorations (inlay, onlay, crown) can be made at the initial preparation and provisionalization appointment.*
3. *Tissue management includes the following methods:*
 - a. Single chemico-mechanical cord technique
 - b. Double chemico-mechanical cord technique
 Both techniques involve placement of retraction cord impregnated with hemostatic agents.
4. *Making the final impression:*
 - a. Full arch impressions must be made for any indirect restoration
 - b. All margins of the preparations and all teeth in the arch must be captured without voids
 - c. Rigid plastic stock trays with the appropriate adhesive must be used
 - d. The adhesive should be allowed to dry at least 10 minutes after painting the tray
5. *PVS impression material must be used for all final impression of indirect restorations.*
 - a. Double mix technique using light and heavy body material is recommended

IMPRESSION MAKING AND TISSUE RETRACTION FOR CONVENTIONAL FINAL IMPRESSIONS (CONT'D)

- 6. Alginate impression of the provisional and the opposing arch must be made.** Impressions must capture all teeth and must be free of voids.
- 7. Students are responsible for pouring implant-level final impressions for soft tissue casts and final impressions for tooth-supported restorations.** Students are responsible for working with the faculty to accomplish this.
- 8. Mounting of the working cast:**
- Students are responsible for mounting both soft tissue casts for implant restorations and working casts for restorations on natural teeth.
 - Working cast is mounted in maximum intercuspation when fabricating:
 - ▶ 1-4 Single-units of anterior or posterior crowns
 - Working cast is mounted in centric occlusion and centric relation when:
 - ▶ Opposing arch is restored with a complete denture
- 9. Interocclusal record:**
- If the casts can be hand articulated with an opposing cast and the casts are stable, an interocclusal record is not needed.
 - PVS material must be used to take the interocclusal record if it is necessary.
 - Interocclusal records must be made only in the area of the preparations and the opposing teeth when mounting in MIP.
- The recording material must not extend to adjacent unprepared teeth and the record must be made with the remaining teeth in contact at the patient's VDO.
 - For CO records, there must be minimal occlusal opening, and minimal PVS material must cover the occlusal surfaces only.
- 10. Record base and wax rim must be used if a vertical stop exists between working and opposing casts when four point contacts are not present.** An elastomeric bite registration material is the material of choice in conjunction with a record base and wax rim. The record is taken with any remaining teeth in contact. The record is obtained at a subsequent appointment so that a record base and wax rim can be fabricated on the final working cast.
- 11. Once the soft tissue working cast and the working cast is appropriately mounted against the opposing cast on a semi-adjustable articulator, the student is responsible for communicating with the Digital Design Technician that the case is ready for lab-based digital scanning.** The student must give the technician the mounted casts, patient information, and selected shade. The technician will be responsible for completing the lab-based digital scan, as well as the digital restoration design. A faculty member must approve the design prior to the restoration being milled. When the restoration has crystallized and characterized, the Digital Design Technician will notify the student.

DIGITAL IMPRESSION MAKING, TISSUE RETRACTION, AND SCANNING PROTOCOL

Before seating the patient, the student must check out and assemble the following items:

- LAPTOP
- THUNDERBOLT ADAPTER
- OPTICAL SCANNER
- STERILIZED SCANNER TIP

Tissue management, including the single chemico-mechanical cord technique or double chemico-mechanical cord technique, must be completed for every type of tooth-supported restoration before making the intraoral digital impression or conventional final impression. At the time of impression, the faculty will decide whether an intraoral digital impression or a conventional final impression will best capture the necessary anatomy.

Digital Dentistry Curriculum Content

The primary intent of this document is to provide dental schools with the information they need to develop curriculum on Digital Dentistry. This document provides a comprehensive list of topics, giving the opportunity for dental schools to pick and choose the elements they think are necessary for their particular school, and to organize the overall curriculum to incorporate objectives, metrics, and knowledge base.

The secondary intent of this outline is to provide guidance to individuals as to what type of document they could provide *American College of Prosthodontics* to share on *Prosthopedia*. Documents may be shared in the following formats: handouts, reading lists, powerpoints, and videos.

In support of the Digital Curriculum, content in the form of presentations, video, manuals, and other forms of educational material will be made available through Prosthopedia, the educational portal of the American College of Prosthodontist. Schools and individuals interested in using these documents for educational purposes should register for access to [Prosthopedia](#). ACP Members currently have access to this website and material.

Implementing a Digital Curriculum may be difficult if you do not have presentations or other forms of instructional and educational information. The source of the information is from current educators in the area, to include other dental schools, lecturers, and in some cases, commercial sources. Each resource made available is peer-reviewed following rubrics developed by Digital

Curriculum Committee and they are classified as to the curriculum content it addresses and whether the information is technically sound, objectives are clear, and the references are accurate as appropriate for the type of educational venue.

The content can be used in part or as a whole to support the digital curriculum, however, this information represents a scholarly work of the author. Slide and images on each document will be watermarked with the author and the institution information. In addition, it is the intent of ACPEF to send an email out to Dean and Academic Dean of each school to propose accepting the original contribution as a publication, because documents are peer reviewed, the number of citation can be reported.

Although the content is presented in this document to support the development of a Digital Curriculum, submission of educational materials is encouraged as well. In addition, it is expected that as programs are developed, they will contribute to the Digital Curriculum content.

SUMMARY OF THE DIGITAL CURRICULUM CONTENT

AVAILABLE ON THE ACP WEBSITE AS PART OF THE CURRICULUM FRAMEWORK AND DIGITAL DENTISTRY MATERIALS

- FOUNDATIONAL KNOWLEDGE OF DIGITAL DENTISTRY
- POWERPOINTS, VIDEOS AND HANDOUTS WITH A BROAD RANGE OF CURRICULUM CONTENT AND DETAILS
- CURRENT READING LISTS BY TOPIC FOR DIGITAL DENTISTRY
- COMPILATION OF DIGITAL DENTISTRY PUBLICATIONS – CURRENT BEST EVIDENCE AS IT RELATES TO DIGITAL TECHNOLOGIES AND THEIR APPLICATION
- INTRODUCTORY, CORE TEXTBOOK ON DIGITAL DENTISTRY
[Fundamentals of CAD/CAM Dentistry](#)
Jonathan L Ferencz, DDS, FACP • Nelson Silva, DDS, MSc, PhD

IMPLEMENTATION OF A DIGITAL CURRICULUM

Predocloral Digital Dentistry:

COMMUNICATIONS PLAN

BUSINESS PLAN

RESOURCE DEVELOPMENT



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Communication Plan

COMMUNICATION RESOURCES

Supplementary resources have been created and are available on the ACP website (www.prosthodontics.org) under ACP Publications.

- ***The Current Impact of Digital Technology in Prosthodontics*** – White Paper, along with a 2.5 page executive summary.
- ***A Survey of Recent Literature*** – The compilation offers the best current science and research as it relates to digital dentistry and its broad applications. A compilation of abstracts in a collaborative effort with five peer-reviewed journals sharing the current digital literature and foundational knowledge. This compilation is organized under key topic headings and provides the best current science, clinical workflows, and outcomes related to the application of digital dentistry. The document allows direct linkage to the parent publication through the journals and is an incredible resource for educators and the entire oral health community.
- ***Glossary of Digital Terminology*** – The first written guide establishing common terminology in digital dentistry. The terms presented are applicable to any user of advanced digital dental technology and can serve as a basis for communication among practitioners and dental laboratories. The glossary is meant to provide a convenient reference for the many devices, file formats, and concepts involved in the use of digital technology in dentistry.
- ***Fundamentals of CAD/CAM Dentistry*** – Introductory, core textbook on digital dentistry. Authors: Jonathan L Ferencz, DDS, FACP and Nelson Silva, DDS, MSc, PhD

ADDITIONAL IMPLEMENTATION RESOURCES

Prosthopedia.prosthodontics.org houses additional resources like the ones listed below. To gain access to this online library, please contact digitalcurriculum@prosthodontics.org.

- Why a digital clinical curriculum is justified – science behind the story
- Curriculum content including presentations, reading lists, videos, etc.

HOW TO ESTABLISH A DIGITAL CURRICULUM – DIGITAL IMPLEMENTATION

1 / IDENTIFICATION OF KEY LEADERS

Identify key leaders responsible for dental technology acquisition and implementation. Their support in this initiative will be critical in the adoption and implementation of technology to support digital dentistry.

GENERAL PARTICIPANTS MAY INCLUDE BUT ARE NOT LIMITED TO:

- DEAN
- DEAN OF FINANCE AND CLINICS
- DEPARTMENT CHAIRS
- CURRICULUM COMMITTEE
- FACULTY – those interested or those with prior experience in digital dentistry technology
- KEY STUDENTS – students that have a stated interest and those that may be likely to use the technology or facilitate the use of the technology
- KEY STAFF – It is critical to engage the Information Technology (IT) Team early in the planning and implantation process. Support staff that will be responsible for the use and maintenance of the digital dentistry hardware and software must be trained and well-prepared. This also includes the pre-patient care and clinical support staff that will be engaged.

THESE INDIVIDUALS MUST BE INCLUDED AT EACH STEP OF THE PROCESS, FROM CONCEPTUAL INTRODUCTION TO IMPLEMENTATION, TO ENSURE THAT ALL KEY PLAYERS ARE SUPPORTIVE OF THE INITIATIVE. ALL INDIVIDUALS WILL FUNCTION AS PART OF A COHESIVE TEAM TO ENSURE IMPLEMENTATION SUCCESS.

2 / IDENTIFICATION OF THE INSTITUTION'S DIGITAL NEEDS

- Conduct a needs assessment for the institution and departments to determine technological needs.
- List and prioritize deficient areas in the curriculum, clinical activities with proposed curricular changes, and technology acquisitions to fill those voids by implementing digital technology.
- Share outcomes with key leaders of the institution and departments. These leaders may include the Dean, Dean of Finance, Department Chairs, Faculty, Key staff, Key students, or other individuals that may impact the decision-making process for technology implementation at your institution.

3 / BUSINESS PLAN PRINCIPLES

A business plan should be developed and shared with the leaders of the institution and departments.

THE BUSINESS PLAN SHOULD INCLUDE:

- Cost and benefit statement
- Fixed cost assessments
- Space requirements of proposed technology
- Costs of proposed equipment and maintenance agreements
- Faculty and staff assessments
- Variable cost assessments
- Per unit dental material costs
- Per patient clinical costs
- Estimates of clinical revenue
- Profit and loss statement built on acceptable assumptions
- Infrastructure shortcomings with proposals for remedy
- Possible barriers to implementation with proposed solutions

4 / INFORMATION TECHNOLOGY (IT) AND SYSTEMS SUPPORT

The Information Technology Team (IT) must be engaged early and as a key component of the planning in support of the implementation of the needed systems. This will be unique to the systems, requirements, and staff at each institution.

Current technology in the marketplace has been largely designed for private practice, and not the complex, large-scale regulatory environments that are part of dental education and the training of hundreds of students. As a result, the IT team is critical to engage early and at a high level. While current technology is remarkable, commercial systems are still fragmented and school based

environments and teams must be able to work through systems to ensure their ongoing functionality.

Consulting with the ACP, their mentors, and/or schools that have been through the implementation process is strongly advised as part of the planning, implementation, and ongoing processes of advancement.

5 / PREDOCTORAL EDUCATIONAL IMPLEMENTS

Identify curricular and practical goals that meet the needs of the institution.

- Formulate or adopt learning objectives for each of these areas
- Integrate both didactic lecture material as well as hands-on components integrating the technology in the preclinical courses
- Formulate or adopt competencies in each of these areas
- Link preclinical activities to clinical learning and outcomes

6 / BENEFITS TO PATIENT CARE

- Workflow improvements with accompanying increases in patient care and satisfaction
- Improvement of patient education
- Opportunities for modern perception of dental practice
- Opportunity for different or improved patient experience
- See also the current documents on the ACP website, these include a Survey of Recent Literature and a broad array of other documents critical to the development and realization of a digital curriculum. The literature compilation offers the best current science and research as it relates to digital dentistry and its broad applications.

7 / CLINICAL IMPLEMENTATION

Communicate the definitive clinical activities, expected outcomes, and how success will be measured with leadership. Success must be discussed at multiple levels including impact on administration, finance, faculty and staff, students, and patients.

- Clinical use is initiated after users – designated faculty, students, and staff – are proficient with the technology.
- Potential for phased adoption of technology – used in designated clinical situations or by designated users.
- All implementation is institution-dependent and will progress according to their specifics and timetable.

(See page 18-20, [Strategies to Implement Digital Dentistry in the Dental Curriculum](#))

Business Plan

THE IMPACT OF DIGITAL CLINICAL EDUCATION

EXECUTIVE SUMMARY

This document presents a financial analysis related to predoctoral digital clinical education and patient care from two institutions – University of Illinois at Chicago (UIC) and The Medical University of South Carolina (MUSC) – to address the following objectives.

- Determine IT requirements and costs
- Present example school budgets based on per unit restoration
- Provide a model P&L for current analog and digital workflows
- Compare current analog workflows with digital workflows
- Develop and report on a model budget plan
- Illustrate annual net income projections

The provided financial analysis highlights “ongoing” budget investment (as opposed to the initial investment) in a predoctoral digital curriculum. Based on the analyzed financial data from the aforementioned institutions, the following conclusions were observed.

1. Significant net gains by incorporating digital workflows into the educational curriculum.
2. Finance should not be viewed as a barrier of digital integration for student and patient care, but rather an opportunity.
3. Improved efficiency and time savings in patient care and student education.
4. Digital dentistry promotes improved patient and student experiences as well as clinical and learning outcomes.



There is an Excel spreadsheet version of the Business Plan. The Excel spreadsheet version provides an interactive tool that allows the institution to utilize their internal information in calculating the operational outcomes. This allows the school to incorporate the school specific budgeting and digital clinical model information into their business planning. The Excel Spreadsheet Business Plan is available on the [ACP Prosthopedia](#) site.

GLOSSARY

REVENUE

Service fee charged per unit restoration.

COST

Cost to deliver each unit restoration inclusive of overhead, materials, lab bill, etc.

PROFIT

REVENUE – COST

PROFIT MARGIN

Profit as a percentage of revenue.

$(\text{REVENUE} - \text{COST}) / \text{REVENUE}$

ANNUAL NET INCOME

Projected profit for the year based on full patient schedule and unit production.



THE UIC EXPERIENCE

1. IT needs relative to the production server and backup of digital files for single-unit restorations are on average ~50 MB per unit. This amounts to \$0.15 per unit for both tooth- and implant-supported restorations.
2. Digital single-unit, implant-supported crowns can be completed within two appointments as opposed to three via the conventional way, freeing student and clinic time for other learning opportunities. In addition, due to a more efficient workflow, time saved pouring and mounting analog casts can be utilized for independent study, research, and community service.
3. The employment of a digital technician to assist with scanning, designing, milling, and finalizing the definitive restoration results in an overall increase fixed overhead of \$16.67 per single-unit, tooth-supported restoration and a decrease of \$44.28 per single-unit, implant-supported restoration relative to the conventional analog approach.
4. Digital single-unit crown fabrication via the complete digital workflow for implant-supported restorations results in a cost reduction of 52% when compared to the conventional analog approach.
5. Digital single-unit crown fabrication for tooth-supported restorations results in a cost reduction of 40% when compared to the conventional analog approach.
6. Profit margins for single-unit, implant-supported restorations via conventional, partial digital, and complete digital workflows are 11%, 43%, and 52%, respectively.
7. Profit margins for single-unit, tooth-supported restorations via conventional and digital workflows are 9% and 45%, respectively.
8. The “break-even point” relative to the calculated annual fixed overhead is 291 single-unit digital implant crowns versus 512 conventional crowns. Thus, an additional 221 conventional crowns must be completed to cover costs associated with the institution’s fixed overhead.
9. The “break-even point” relative to the calculated annual fixed overhead is 418 single-unit digital, tooth-supported crowns versus 724 conventional crowns. Thus, an additional 306 conventional crowns must be completed to cover costs associated with the institution’s fixed overhead.
10. The annual net income is 8.8 times more via the digital workflow as compared to the conventional workflow for implant-supported, single-unit restorations.
11. The annual net income is 5.3 times more via the digital workflow as compared to the conventional workflow for tooth-supported, single-unit restorations. Significant net gains by incorporating digital workflows into the educational curriculum.

THE MUSC EXPERIENCE



1. IT needs relative to the production server and backup of digital files for single-unit restorations amount to an average of ~50 MB per unit. The cost per unit for both tooth- and implant-supported restorations could not be calculated specifically at this time for our institution. At MUSC, the university provides these services packaged under an “Activity and Services Fee” (A&S). This fee packages together many other larger services provided by the university to each department on a per square foot basis, leaving us unable to tease out the individual storage cost per file.
2. Complete information was unavailable at this time to report on implant digital overhead and cost savings. Although, it is inherently believed at this time that there is a cost savings with the digital impression technique.
3. Digital single-unit crown fabrication via a single visit for tooth-supported restorations results in a cost reduction of 61% when compared to the conventional analog approach.
4. Digital impression crown fabrication via outsourcing to a commercial lab for tooth-supported restorations results in a cost reduction of 25% when compared to the conventional analog approach.
5. Profit margins for single-unit, tooth-supported restorations via conventional, digital impression, and digital-single visit workflow are 10%, 33%, and 40%, respectively.
6. The “break-even point” relative to the calculated annual fixed overhead is 433 single-unit, single-visit digital tooth-supported crowns and 607 digital impression crowns, versus 675 conventional crowns. Thus, an additional 68-242 conventional crowns must be completed to cover costs associated with the institution’s fixed overhead when compared to digital impression and complete digital workflows respectively.
7. The annual net income is 12.1 times more via the complete, single visit digital workflow as compared to the conventional workflow for tooth-supported, single-unit restorations.
8. The annual net income is 5.2 times more via the digital impression workflow outsourced to a commercial lab as compared to the conventional workflow for tooth-supported, single-unit restorations.

INSTITUTION

**UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY**

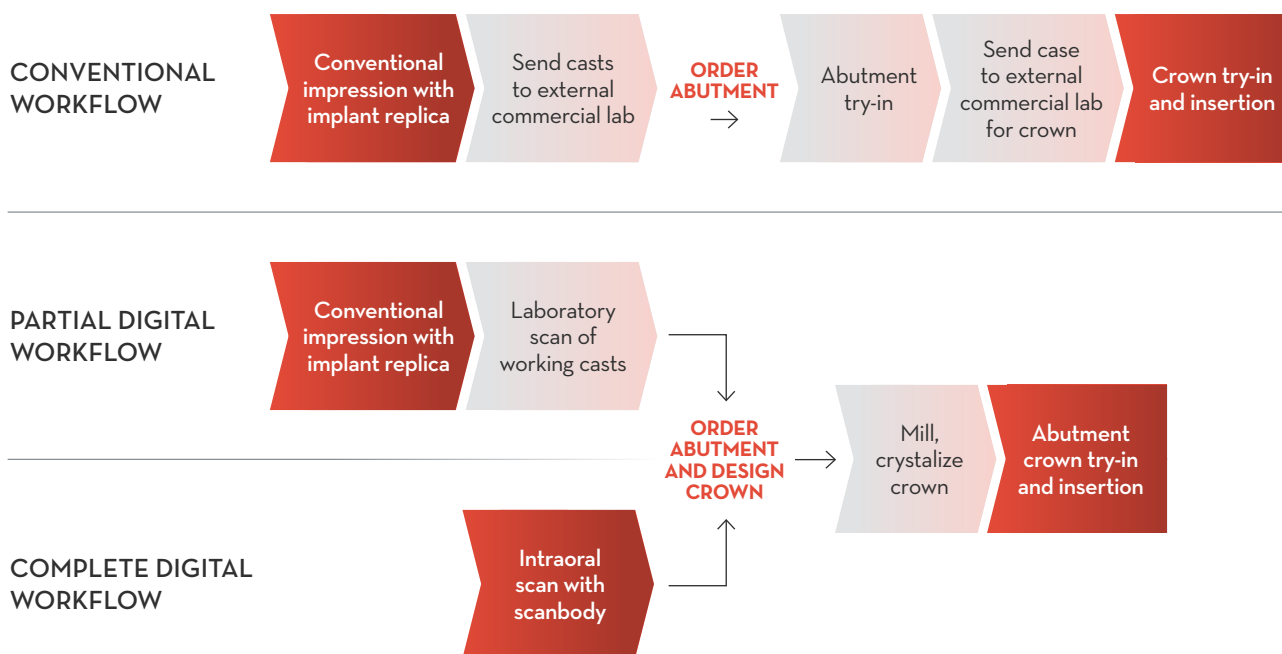
Fatemeh S. Afshari, DMD, MS



PROGRAM DESCRIPTION

The predoctoral curriculum at UIC encompasses pre-patient and clinical experiences in both tooth-supported and implant-supported, single-unit restorations. With the assistance of a digital technician, digital restorations are scanned, designed, and milled in-house using the E4D (tooth-supported only) and Trios (tooth- and implant-supported) systems. The following figures depict the conventional (analog) and digital workflows for each type of restoration.

Figure 1. UIC predoctoral implant program displaying the conventional, partial digital, and complete digital techniques for fabricating implant-supported, single-unit definitive restoration.

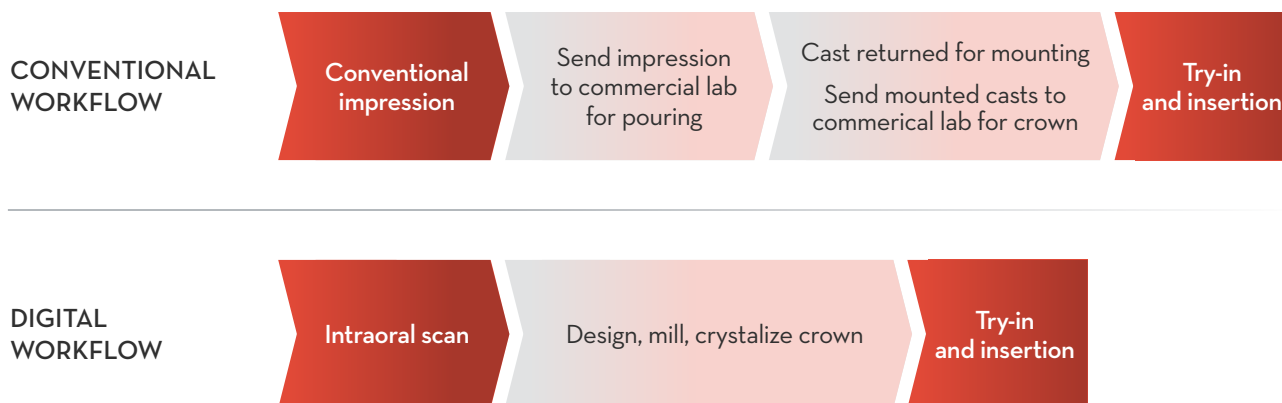


INSTITUTION (CONT'D)

**UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY**

PROGRAM DESCRIPTION (CONT'D)

Figure 2. UIC predoctoral digital curriculum displaying the conventional and digital techniques for fabricating tooth-supported, single-unit definitive restoration.



IT NEEDS – SUMMARY EVALUATION

Ongoing cost relative to storage of digital files within the UIC institution was assessed. The approximate cost for storage is as follows:

STORAGE PROCESS	COST
Production Server Storage	\$1000/TB
Backup Server 1 Storage (local/on-premise)	\$1000/TB
Backup Server 2 Storage (cloud)	\$500/TB
Operational Overhead, Maintenance, etc.	\$500/TB
TOTAL	\$3000/TB

AVERAGE TOOTH- AND IMPLANT-SUPPORTED TRIOS INTRAORAL

49.7 MB/UNIT \$0.15/UNIT

AVERAGE TOOTH-SUPPORTED E4D INTRAORAL

354 MB/UNIT \$1.06/UNIT

Sample tooth- and implant-supported digital restoration were compiled to determine average file sizes per unit based on intraoral Trios and E4D scans. Based on average storage costs outlined above, an average tooth- or implant-supported restoration via a Trios scan is 49.7 MB, resulting in a cost of \$0.15 per unit. An average tooth-supported restoration via an E4D scan is 354 MB, resulting in a cost of \$1.06 per unit.

INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PRODUCTION AND LOSS PER UNIT RESTORATION – IMPLANT-SUPPORTED RESTORATION

The total fixed overhead, total cost, collected fee, and profit margin were assessed on a per unit restoration basis for implant-supported restorations. *The presented data does not include initial investment in equipment and software, as those may vary significantly between institutions.* Various models for technology access are being established. The data also does not include maintenance fees and software updates relative to the digital equipment and software.

COSTS	CONVENTIONAL	PARTIAL DIGITAL	COMPLETE DIGITAL
FACULTY SALARY	\$110,000	\$110,000	\$110,000
FRINGES (FACULTY, UIC RATE 5%)	\$5,500	\$5,500	\$5,500
TECHNICIAN SALARY & FRINGE	\$0	\$60,000	\$60,000
DENTAL ASSISTANT	\$45,000	\$45,000	\$45,000
FRONT DESK	\$45,000	\$45,000	\$45,000
% TECHNICIAN ALLOCATED TIME TO PIP	25%	25%	25%
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	25%	25%	25%
% FRONT DESK ALLOCATED TIME TO PIP	33%	33%	33%
TOTAL FIXED OVERHEAD COST (FOH)	\$141,600.00	\$156,600.00	\$156,600.00
FIXED OVERHEAD PER WEEK <i>(45 Weeks of Clinic Per Year)</i>	\$3,146.67	\$3,480.00	\$3,480.00
Clinic Periods Per Week	8	8	8
FIXED OVERHEAD PER CLINIC SESSION <i>(÷ Week Cost by # of Periods)</i>	\$393.33	\$435.00	\$435.00
Chairs Per Clinic Session	7	7	7
FIXED OVERHEAD PER CHAIR <i>(÷ Clinic Session by # of Chairs)</i>	\$56.19	\$62.14	\$62.14
Number of Chair Visits Required	3	2	2
FIXED OVERHEAD PER RESTORATION <i>(Multiply FOH Per Chair by Required Visits)</i>	\$168.57	\$124.29	\$124.29
CHAIR SETUP COST PER RESTORATION	\$14	\$9	\$9
MATERIAL COST PER RESTORATION	\$77.15	\$112.00	\$44.92
BLOCK & CORE FILE COST PER RESTORATION	\$0	\$31	\$31
LAB COST PER RESTORATION	\$456	\$177	\$177
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$715.74	\$453.87	\$386.80

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INSTITUTION (CONT'D)

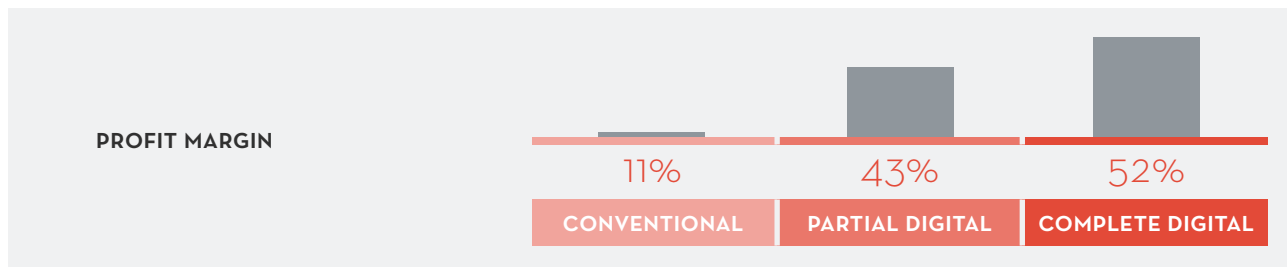
UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PRODUCTION AND LOSS PER UNIT RESTORATION – IMPLANT-SUPPORTED RESTORATION (CONT'D)

COSTS	CONVENTIONAL	PARTIAL DIGITAL	COMPLETE DIGITAL
FEE COLLECTED PER ABUTMENT & CROWN	\$802	\$802	\$802
TOTAL PROFIT	\$86	\$348.13	\$415.20

Based on the total profit per restoration via each workflow, we have calculated an *overall cost reduction* of 37% with the partial digital workflow and a 46% cost reduction with the complete digital workflow.

COSTS	PARTIAL DIGITAL	COMPLETE DIGITAL
OVERALL COST REDUCTION \$ (Per Restoration)	\$261.87	\$328.95
OVERALL COST REDUCTION % (Per Restoration)	37%	46%



INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PRODUCTION AND LOSS PER UNIT RESTORATION – IMPLANT-SUPPORTED RESTORATION (CONT'D)

An alternative analysis of the data can assist in determining the number of restorations required annually to cover the fixed overhead costs. The “*break-even points*” for the number of conventional, partial digital, and complete digital workflow are 512, 332, and 291 single-unit restorations annually.

COSTS	CONVENTIONAL	PARTIAL DIGITAL	COMPLETE DIGITAL
FEE COLLECTED PER ABUTMENT & CROWN	\$802.00	\$802.00	\$802.00
MATERIAL COST PER RESTORATION	\$77.15	\$112.00	\$44.92
BLOCK & CORE FILE COST PER RESTORATION	\$0	\$31	\$31
LAB COST PER RESTORATION	\$435	\$177	\$177
CHAIR SET-UP COST PER RESTORATION	\$13.57	\$9.05	\$9.05
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$525.22	\$329.59	\$262.51
CONTRIBUTION MARGIN	\$276.78	\$472.41	\$539.49
FACULTY SALARY	\$110,000	\$110,000	\$110,000
FRINGES (FACULTY, UIC RATE 5%)	\$5,500	\$5,500	\$5,500
TECHNICIAN SALARY & FRINGE	\$0	\$60,000	\$60,000
DENTAL ASSISTANT	\$45,000	\$45,000	\$45,000
FRONT DESK	\$45,000	\$45,000	\$45,000
% TECHNICIAN ALLOCATED TIME TO PIP	25%	25%	25%
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	25%	25%	25%
% FRONT DESK ALLOCATED TIME TO PIP	33%	33%	33%
TOTAL FIXED OVERHEAD COST	\$141,600	\$156,600	\$156,600
BREAK-EVEN POINT <i>(Number of Abutment & Crown Procedures Needed)</i>	511.60	331.49	290.27
# OF SESSIONS REQUIRED PER RESTORATION	3	2	2
TOTAL SESSIONS REQUIRED TO BREAK-EVEN	1,534.81	662.98	580.55

INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PRODUCTION AND LOSS PER UNIT RESTORATION – TOOTH-SUPPORTED RESTORATION

The total fixed overhead, total cost, collected fee, and profit margin were assessed on a per unit restoration basis for implant-supported restorations. The presented data does not include initial investment in equipment and software, as those may vary significantly between institutions. It also does not include maintenance fees and software updates relative to the digital equipment and software.

COSTS	CONVENTIONAL	DIGITAL
FACULTY SALARY	\$110,000	\$110,000
FRINGES (FACULTY, UIC RATE 5%)	\$5,500	\$5,500
TECHNICIAN SALARY & FRINGE	\$0	\$60,000
DENTAL ASSISTANT	\$45,000	\$45,000
FRONT DESK	\$45,000	\$45,000
% TECHNICIAN ALLOCATED TIME	25%	25%
% DENTAL ASSISTANT ALLOCATED TIME	25%	25%
% FRONT DESK ALLOCATED TIME	33%	33%
TOTAL FIXED OVERHEAD COST (FOH)	\$141,600.00	\$156,600.00
FIXED OVERHEAD PER WEEK <i>(45 Weeks of Clinic Per Year)</i>	\$3,146.67	\$3,480.00
Clinic Periods Per Week	40	40
FIXED OVERHEAD PER CHAIR <i>(÷ Clinic Session by # of Chairs)</i>	\$78.67	\$87.00
Number of Chair Visits Required	2	2
FIXED OVERHEAD PER RESTORATION <i>(Multiply FOH Per Chair by Required Visits)</i>	\$157.33	\$174.00
CHAIR SETUP COST PER RESTORATION	\$9.05	\$9.05
MATERIAL COST PER RESTORATION	\$71.27	\$36.53
BLOCK & IT STORAGE COST PER RESTORATION	—	\$24.58
LAB COST PER RESTORATION	\$169	—
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$406.65	\$244.16
FEE COLLECTED PER RESTORATION	\$445.00	\$445.00
TOTAL PROFIT	\$38	\$200.84

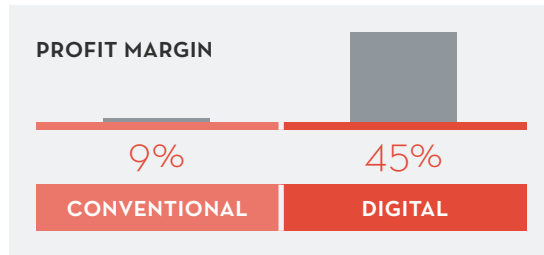
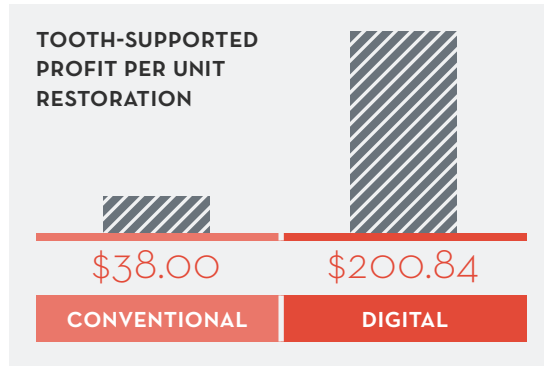
INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PRODUCTION AND LOSS PER UNIT RESTORATION – TOOTH-SUPPORTED RESTORATION (CONT'D)

Based on the total profit per restoration via each workflow, we calculate an *overall cost reduction* of 40% with the digital workflow as compared to the conventional.

COSTS	DIGITAL
OVERALL COST REDUCTION \$ <i>(Per Restoration)</i>	\$162.49
OVERALL COST REDUCTION % <i>(Per Restoration)</i>	40%



INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PRODUCTION AND LOSS PER UNIT RESTORATION – TOOTH-SUPPORTED RESTORATION (CONT'D)

An alternative analysis of the data assists in determining the number of restorations required annually to cover the fixed overhead costs. The “*break-even points*” for the number of conventional and digital workflow are 724 and 418 single-unit restorations annually.

COSTS	CONVENTIONAL	DIGITAL
FEE COLLECTED PER RESTORATION	\$445.00	\$445.00
MATERIAL COST PER RESTORATION	\$71.27	\$36.53
BLOCK & IT STORAGE COST PER RESTORATION	–	\$24.58
LAB COST PER RESTORATION	\$169	–
CHAIR SET-UP COST PER RESTORATION	\$9.05	\$9.05
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$249.32	\$70.16
CONTRIBUTION MARGIN	\$195.68	\$374.84
FACULTY SALARY	\$110,000	\$110,000
FRINGES (FACULTY, UIC RATE 5%)	\$5,500	\$5,500
TECHNICIAN SALARY & FRINGE	\$0	\$60,000
DENTAL ASSISTANT	\$45,000	\$45,000
FRONT DESK	\$45,000	\$45,000
% TECHNICIAN ALLOCATED TIME TO PIP	25%	25%
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	25%	25%
% FRONT DESK ALLOCATED TIME TO PIP	33%	33%
TOTAL FIXED OVERHEAD COST	\$141,600	\$156,600
BREAK-EVEN POINT <i>(Number of Crown Procedures Needed)</i>	723.64	417.78
NUMBER OF SESSIONS	2	2
TOTAL SESSIONS REQUIRED TO BREAK-EVEN	1,447.27	835.56

INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PROJECTED ANNUAL NET INCOME – IMPLANT-SUPPORTED RESTORATION

Projected annual net income for the conventional, partial digital, and complete digital workflows are presented below. However, the presented projection is based on a 100% utilization rate and 100% chair availability for single-unit implant restorations.

COSTS	CONVENTIONAL	PARTIAL DIGITAL	COMPLETE DIGITAL
FACULTY SALARY	\$110,000	\$110,000	\$110,000
FRINGES (FACULTY, UIC RATE 5%)	\$5,500	—	—
TECHNICIAN SALARY & FRINGE	\$0	\$60,000	\$60,000
DENTAL ASSISTANT	\$45,000	\$45,000	\$45,000
FRONT DESK	\$45,000	\$45,000	\$45,000
% TECHNICIAN ALLOCATED TIME TO PIP	25%	25%	25%
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	25%	25%	25%
% FRONT DESK ALLOCATED TIME TO PIP	33%	33%	33%
TOTAL FIXED OVERHEAD COST (FOH)	\$141,600.00	\$151,100.00	\$151,100.00
FIXED OVERHEAD PER WEEK <i>(45 Weeks of Clinic Per Year)</i>	\$3,146.67	\$3,357.78	\$3,357.78
Clinic Periods Per Week	8	8	8
FIXED OVERHEAD PER CLINIC SESSION <i>(÷ Week Cost by # of Periods)</i>	\$393.33	\$419.72	\$419.72
Chairs Per Clinic Session	7	7	7
FIXED OVERHEAD PER CHAIR <i>(÷ Clinic Session by # of Chairs)</i>	\$56.19	\$59.96	\$59.96
Number of Chair Visits Required	3	2	2
FIXED OVERHEAD PER RESTORATION <i>(Multiply FOH Per Chair by Required Visits)</i>	\$168.57	\$119.92	\$119.92
CHAIR SETUP COST PER RESTORATION	\$13.57	\$9.05	\$9.05
MATERIAL COST PER RESTORATION	\$77.15	\$112.00	\$44.92
BLOCK & CORE FILE COST PER RESTORATION	—	\$31.49	\$31.49
LAB COST PER RESTORATION	\$456	\$177	\$177
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$715.74	\$449.51	\$382.43

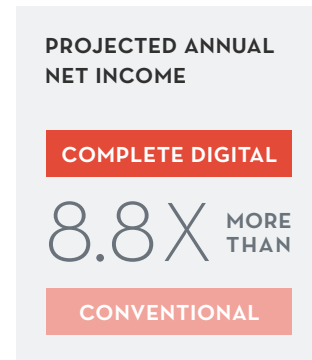
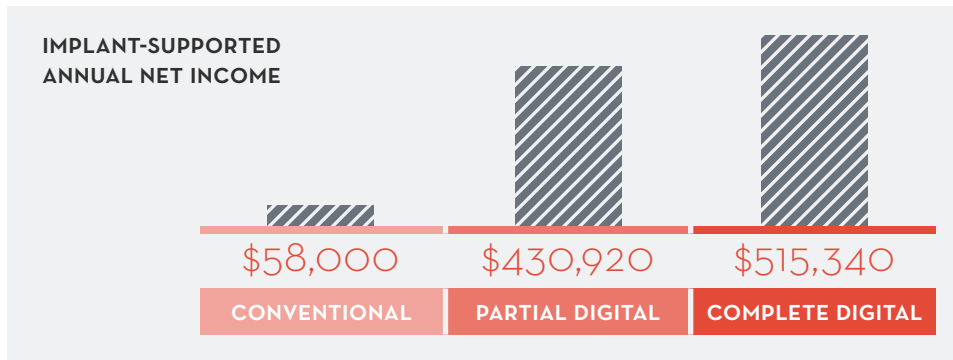
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INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PROJECTED ANNUAL NET INCOME – IMPLANT-SUPPORTED RESTORATION (CONT'D)

COSTS	CONVENTIONAL	PARTIAL DIGITAL	COMPLETE DIGITAL
FEE COLLECTED PER RESTORATION	\$802.00	\$802.00	\$802.00
PROFIT PER RESTORATION	\$86.26	\$352.49	\$419.57
ROUND REV/REST TO NEAREST INTEGER	\$70.00	\$342.00	\$409.00
# OF CROWNS PER FACULTY EACH YEAR	840	1260	1260
ANNUAL NET INCOME PER FACULTY	\$58,800	\$430,920	\$515,340



INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PROJECTED ANNUAL NET INCOME – TOOTH-SUPPORTED RESTORATION

Projected annual net income for the conventional and digital workflows are presented below. However, the presented projection is based on a 100% utilization rate and 100% chair availability for single-unit implant restorations.

COSTS	CONVENTIONAL	DIGITAL
FACULTY SALARY	\$110,000	\$110,000
FRINGES (FACULTY, UIC RATE 5%)	\$5,500	\$5,500
TECHNICIAN SALARY & FRINGE	—	\$60,000
DENTAL ASSISTANT	\$45,000	\$45,000
FRONT DESK	\$45,000	\$45,000
% TECHNICIAN ALLOCATED TIME TO PIP	25%	25%
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	25%	25%
% FRONT DESK ALLOCATED TIME TO PIP	33%	33%
TOTAL FIXED OVERHEAD COST (FOH)	\$141,600.00	\$156,600.00
FIXED OVERHEAD PER WEEK <i>(45 Weeks of Clinic Per Year)</i>	\$3,146.67	\$3,480.00
Chairs Available Per Week	40	40
FIXED OVERHEAD PER CHAIR <i>(÷ Clinic Session by # of Chairs)</i>	\$78.67	\$87.00
Number of Chair Visits Required	2	2
FIXED OVERHEAD PER RESTORATION <i>(Multiply FOH Per Chair by Required Visits)</i>	\$157.33	\$174.00
CHAIR SETUP COST PER RESTORATION	\$9.05	\$9.05
MATERIAL COST PER RESTORATION	\$71.27	\$36.53
BLOCK & IT STORAGE COST PER RESTORATION	—	\$24.58
LAB COST PER RESTORATION	\$169	—
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$406.65	\$244.16

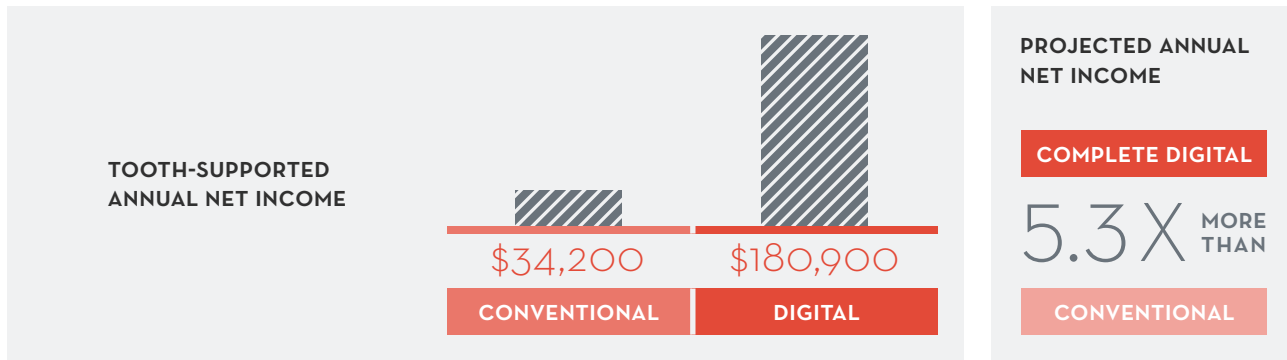
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INSTITUTION (CONT'D)

UNIVERSITY OF ILLINOIS AT CHICAGO
DEPARTMENT OF RESTORATIVE DENTISTRY

PROJECTED ANNUAL NET INCOME – TOOTH-SUPPORTED RESTORATION (CONT'D)

COSTS	CONVENTIONAL	DIGITAL
FEE COLLECTED PER RESTORATION	\$445.00	\$445.00
PROFIT PER RESTORATION <i>(Fee Collected - Total Cost)</i>	\$38.35	\$200.84
ROUND REV/REST TO NEAREST INTEGER	\$38	\$201
# OF CROWNS PER FACULTY EACH YEAR	900	900
ANNUAL NET INCOME PER FACULTY	\$34,200	\$180,900



INSTITUTION

**MEDICAL UNIVERSITY OF SOUTH CAROLINA
DEPARTMENT OF ORAL REHABILITATION**

Monica J Cayouette, DMD, MS, FACP

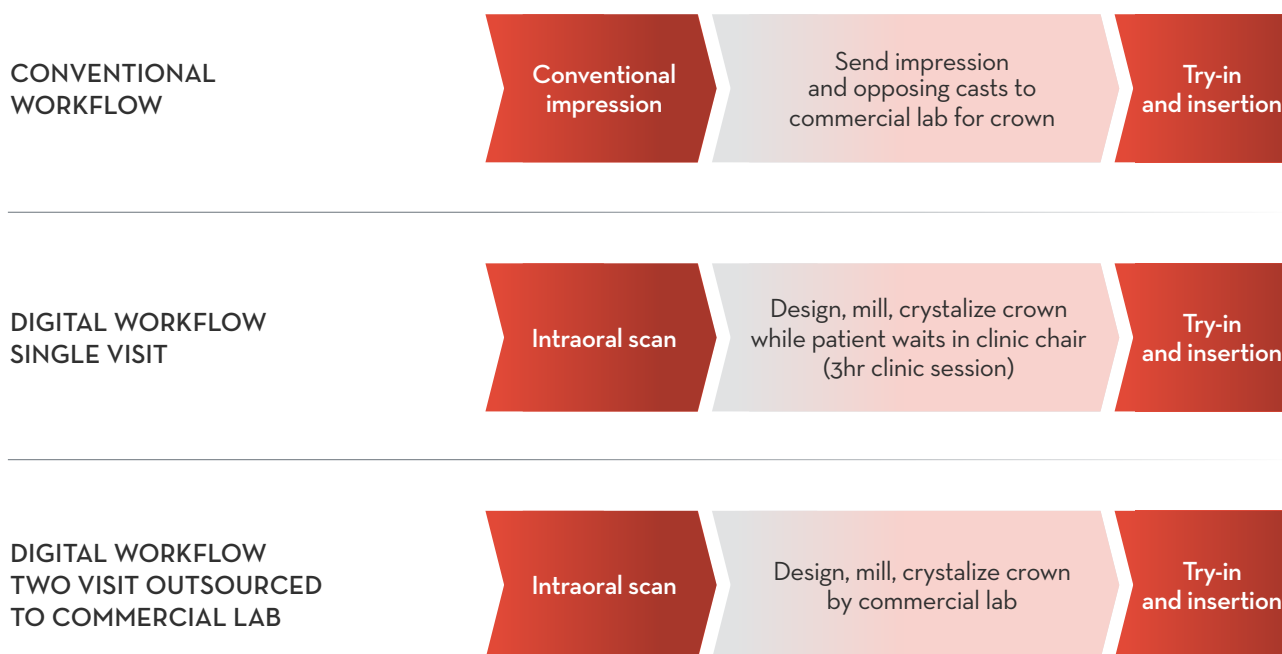


PROGRAM DESCRIPTION

The predoctoral digital curriculum at MUSC is woven throughout the entire four years of the undergraduate training to include both preclinical and clinical courses. In the preclinical courses, students learn to scan for dental morphology fixed prosthodontics courses. Clinically, students have the opportunity to utilize digital workflows for both tooth- and implant-supported restorations. Digital removable partial denture (RPD) design is also included both preclinically and clinically. *Note: the RPD curriculum workflow and finances are not included as a part of this report.*

The introduction to scanning wax-ups and tooth preparations is particularly significant in providing our students with self assessment opportunities and a stronger start entering the clinical phase of their training. There are two primary digital workflows available for predoctoral students in the restorative clinics. These include both single visit in-house milled restorations and two visit outsourced restorations.

With the aid of a dedicated digital dental assistant, digital restorations are scanned, designed, and milled in-house for single visit appointments using both E4D and CEREC (tooth-supported only). The second workflow utilizes 3Shape Trios scanners to outsource restorations for both tooth- and implant-supported restorations. The following figures depict the conventional (analog) and digital workflows for each type of restoration. *Note: implant finances are not included as a part of this report.*

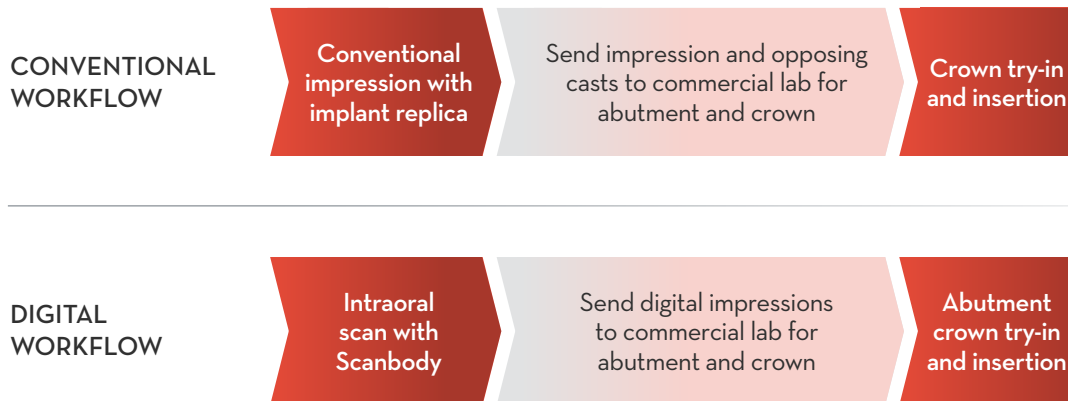


INSTITUTION (CONT'D)

MEDICAL UNIVERSITY OF SOUTH CAROLINA DEPARTMENT OF ORAL REHABILITATION

PROGRAM DESCRIPTION (CONT'D)

Figure 3. MUSC predoctoral implant program displaying the conventional, and complete digital workflows for fabricating implant-supported, single-unit definitive restoration.



IT NEEDS – SUMMARY EVALUATION

Ongoing cost relative to the storage of digital files within the MUSC institution cannot be determined at this time due to aforementioned factors. Instead, an activity and services fee was determined for payment to the university on an annual basis per square footage. This fee was approximated to be just over \$20,000 per clinic involved in digital workflows.

INSTITUTION (CONT'D)

MEDICAL UNIVERSITY OF SOUTH CAROLINA
DEPARTMENT OF ORAL REHABILITATION

PRODUCTION AND LOSS PER UNIT RESTORATION – TOOTH-SUPPORTED RESTORATION

The total fixed overhead, total cost, collected fee, and profit margin were assessed on a per unit restoration basis for tooth-supported restorations. The presented data does not include initial investment in equipment and software, as those may vary significantly between institutions. It also does not include maintenance fees and software updates relative to the digital equipment and software.

COSTS	CONVENTIONAL	DIGITAL IMPRESSION	SINGLE VISIT
FACULTY SALARY	\$100,000	\$100,000	\$100,000
DENTAL ASSISTANT (100% OF SALARY)	\$35,000	\$35,000	\$35,000
FRONT DESK (20% OF SALARY)	\$6,000	\$6,000	\$6,000
FRINGES (FACULTY AND STAFF)	\$42,300	\$42,300	\$42,300
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	100%	100%	100%
% FRONT DESK ALLOCATED TIME TO PIP	20%	20%	20%
ACTIVITY & SERVICES FEES (A&S) PER CLINIC	\$20,442	\$20,442	\$20,442
ACTIVITY & SERVICES FEES (A&S) FOR 2.2 EMPLOYEES	\$7,659.60	\$7,659.60	\$7,659.60
TOTAL FIXED OVERHEAD COST (FOH)	\$211,401.60	\$211,401.60	\$211,401.60
FIXED OVERHEAD PER WEEK <i>(45 Weeks of Clinic Per Year)</i>	\$4,697.81	\$4,697.81	\$4,697.81
Clinic Periods Per Week	9	9	8
FIXED OVERHEAD PER CLINIC SESSION <i>(÷ Week Cost by # of Periods)</i>	\$521.97	\$521.97	\$587.23
Chairs Per Clinic Session	6	6	4
FIXED OVERHEAD PER CHAIR <i>(÷ Clinic Session by # of Chairs)</i>	\$87	\$87	\$146.81
Number of Chair Visits Required	3	2	1
FIXED OVERHEAD PER RESTORATION <i>(Multiply FOH Per Chair by Required Visits)</i>	\$261	\$174	\$146.81
CHAIR SETUP, MATERIAL COST, AND LAB FEE PER RESTORATION	\$210	\$175	\$35
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$471	\$349	\$181.81
FEE COLLECTED PER CROWN	\$523.00	\$523.00	\$523.00
TOTAL PROFIT	\$52.00	\$174.00	\$341.19

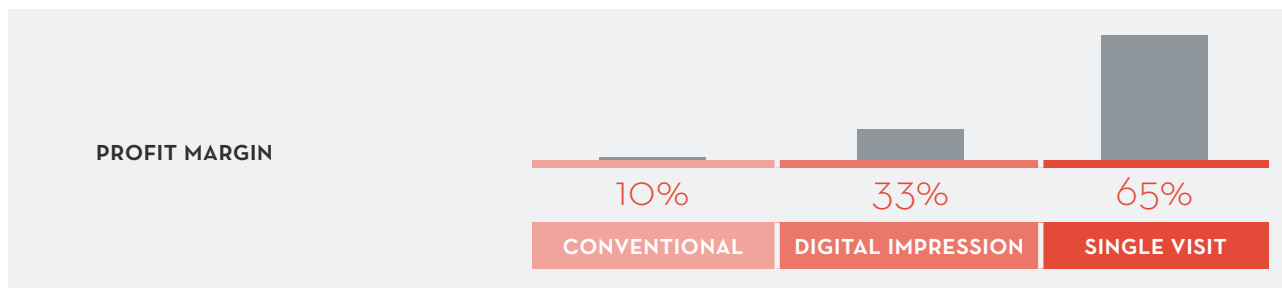
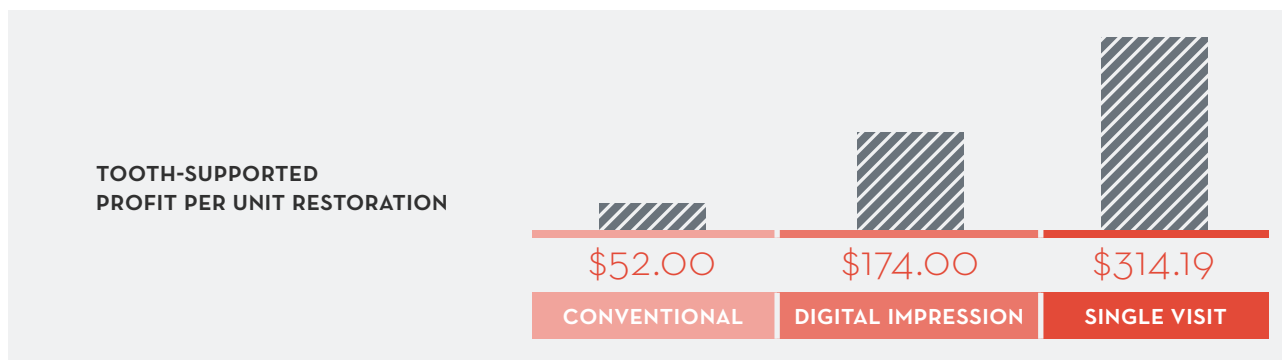
INSTITUTION (CONT'D)

**MEDICAL UNIVERSITY OF SOUTH CAROLINA
DEPARTMENT OF ORAL REHABILITATION**

PRODUCTION AND LOSS PER UNIT RESTORATION – TOOTH-SUPPORTED RESTORATION (CONT'D)

Based on the *total profit per restoration* via each workflow, we calculate an overall cost reduction of 25% with the digital impression workflow and 61% with the single visit as compared to the conventional.

COSTS	DIGITAL IMPRESSION	SINGLE VISIT
OVERALL COST REDUCTION \$ (Per Restoration)	\$122.00	\$289.19
OVERALL COST REDUCTION % (Per Restoration)	25%	61%



INSTITUTION (CONT'D)

MEDICAL UNIVERSITY OF SOUTH CAROLINA
DEPARTMENT OF ORAL REHABILITATION

PRODUCTION AND LOSS PER UNIT RESTORATION – TOOTH-SUPPORTED RESTORATION (CONT'D)

An alternative analysis of the data assists in determining the number of restorations required annually to cover the fixed overhead costs. The “*break-even points*” for the number of conventional, digital impression, and single visit workflows are 675, 607, and 433 single-unit restorations annually.

COSTS	CONVENTIONAL	DIGITAL IMPRESSION	SINGLE VISIT
FEE COLLECTED PER ABUTMENT & CROWN	\$523.00	\$523.00	\$523.00
CHAIR SETUP, MATERIAL COST, AND LAB FEE PER RESTORATION	\$210.00	\$175.00	\$35
CONTRIBUTION MARGIN	\$313.00	\$348.00	\$488.00
FACULTY SALARY	\$100,000	\$100,000	\$100,000
DENTAL ASSISTANT (100% OF SALARY)	\$35,000	\$35,000	\$35,000
FRONT DESK (20% OF SALARY)	\$6,000	\$6,000	\$6,000
FRINGES (FACULTY AND STAFF)	\$42,300	\$42,300	\$42,300
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	100%	100%	100%
% FRONT DESK ALLOCATED TIME TO PIP	20%	20%	20%
ACTIVITY & SERVICES FEES (A&S) PER CLINIC	\$20,442	\$20,442	\$20,442
ACTIVITY & SERVICES FEES (A&S) FOR 2.2 EMPLOYEES	\$7,659.60	\$7,659.60	\$7,659.60
TOTAL FIXED OVERHEAD COST	\$211,401.60	\$211,401.60	\$211,401.60
BREAK-EVEN POINT <i>(Number of Crown Procedures Needed)</i>	675.40	607.47	433.20
NUMBER OF SESSIONS	3	2	1
TOTAL SESSIONS REQUIRED TO BREAK-EVEN	2026	1215	433

INSTITUTION (CONT'D)

MEDICAL UNIVERSITY OF SOUTH CAROLINA
DEPARTMENT OF ORAL REHABILITATION

PROJECTED ANNUAL NET INCOME – TOOTH-SUPPORTED RESTORATION

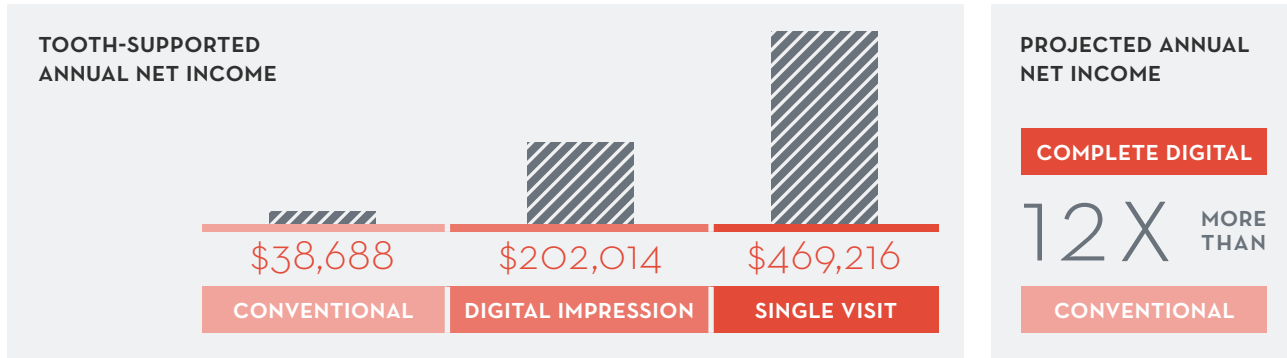
Projected annual net income for the conventional, digital impression, and digital workflows are presented below. However, the presented projection is based on a 100% utilization rate and 100% chair availability for single-unit, tooth-supported restorations.

COSTS	CONVENTIONAL	DIGITAL IMPRESSION	SINGLE VISIT
FACULTY SALARY	\$100,000	\$110,000	\$110,000
DENTAL ASSISTANT (100% OF SALARY)	\$35,000	\$35,000	\$35,000
FRONT DESK (20% OF SALARY)	\$6,000	\$6,000	\$6,000
FRINGES (FACULTY AND STAFF)	\$42,300	\$42,300	\$42,300
% DENTAL ASSISTANT ALLOCATED TIME TO PIP	100%	100%	100%
% FRONT DESK ALLOCATED TIME TO PIP	20%	20%	20%
ACTIVITY & SERVICES FEES (A&S) PER CLINIC	\$20,442	\$20,442	\$20,442
ACTIVITY & SERVICES FEES (A&S) FOR 2.2 EMPLOYEES	\$7,659.60	\$7,659.60	\$7,659.60
TOTAL FIXED OVERHEAD COST (FOH)	\$211,401.60	\$211,401.60	\$211,401.60
FIXED OVERHEAD PER WEEK <i>(45 Weeks of Clinic Per Year)</i>	\$4,697.81	\$4,697.81	\$4,697.81
Chairs Available Per Week	54	54	32
FIXED OVERHEAD PER CHAIR <i>(÷ Clinic Session by # of Chairs)</i>	\$87	\$87	\$146.81
Number of Chair Visits Required	3	2	1
FIXED OVERHEAD PER RESTORATION <i>(Multiply FOH Per Chair by Required Visits)</i>	\$261	\$174	\$146.81
CHAIR SETUP, MATERIAL COST, AND LAB FEE PER RESTORATION	\$210	\$175	\$35
TOTAL COST PER RESTORATION <i>(Total FOH Cost + Material/Lab/Chair Cost)</i>	\$471	\$349	\$181.81
FEE COLLECTED PER RESTORATION	\$523.00	\$523.00	\$523.00
PROFIT PER RESTORATION <i>(Fee Collected - Total Cost)</i>	\$52.00	\$174.00	\$341.00
ROUND REV/REST TO NEAREST INTEGER	\$52	\$174	\$341
# PER FACULTY EACH YEAR	744	1161	1376
ANNUAL NET INCOME PER FACULTY	\$38,688	\$202,014	\$469,216

INSTITUTION (CONT'D)

MEDICAL UNIVERSITY OF SOUTH CAROLINA
DEPARTMENT OF ORAL REHABILITATION

PROJECTED ANNUAL NET INCOME – TOOTH-SUPPORTED RESTORATION (CONT'D)



Resource Development

THE IMPACT OF DIGITAL CLINICAL EDUCATION

EXECUTIVE SUMMARY

Given the budget limitations of most dental schools and the high initial cost of technology along with the licensing fees and software updates, it can be advantageous to introduce technology in accordance with the following model.

A small area in the clinic can be designated with the future in mind. Six to ten operatories can be designed and equipped with state-of-the-art equipment (see attached document: “Technology equipment to be introduced: Clinical). The main goal is to have the students gain experience with technology-enhanced patient care under the supervision of experienced faculty and to use equipment not available in the main clinic. By dedicating an area for clinical application and experiences, the total number of chairs and students that need access to the technology can be focused, thereby reducing the initial investments. This area can be incredibly productive as shared in the attached business plan, UIC and MUSC experiences. A clinic with 10 or fewer chairs focused on supporting clinical expectations and

competencies as recommended in this curriculum, and as defined by the institution, will only need the technology listed under 10-dental units below. Alternatively, broad dissemination into the general clinics may be used with the anticipated changes in technology needs and access to cover these areas. Pre-patient care needs must also be considered. The faculty should have experience with technology as well as a rational approach to its use. This model will allow the school to invest in technology equipment gradually until the whole clinic is updated. A table representing the estimated number of specific pieces of equipment and other resources needed to integrate digital dentistry education per number of units is presented as a possible means of implementation.

ESTIMATED NUMBER OF SPECIFIC PIECES OF EQUIPMENT AND OTHER RESOURCES NEEDED TO INTEGRATE DIGITAL DENTISTRY EDUCATION

NUMBER OF DENTAL UNITS	100	50	20	10
CARIES DETECTION DEVICES	3	2	1	1
ORAL CANCER SCREENING DEVICE	2	1	1	1
CBCT	1	1	1	1
DIGITAL X-RAY SENSORS	6	4	3	2
INTRAORAL DIGITAL CAMERA	6	4	2	1
INTRAORAL DIGITAL SCANNER	10	5	3	2
CAD/CAM MILLING MACHINES	4	2	1	1
LABORATORY SCANNERS	7	5	3	2
SHADE SELECTION DEVICE	4	2	1	1
HD DIGITAL CAMERA	<i>Each student to be issued their own</i>	<i>Each student to be issued their own</i>	<i>Each student to be issued their own</i>	<i>Each student to be issued their own</i>

TECHNOLOGY EQUIPMENT TO BE INTRODUCED – CLINICAL

PRECANCEROUS SCREENING

Students will use precancerous screening instruments during the examination and diagnostic phase when a patient presents a suspicious lesion during treatment or recall visit.

RATIONALE – Introduce the students to the concept of precancerous screening as part of the routine oral exam in order to convey the importance of early detection and prevention of oral cancer.

DIGITAL IMPRESSIONS

Students will use intraoral scanning systems in order to scan, design, and mill all-ceramic restorations.

CLINICAL – Students will use the intraoral scanners in the clinic to mill inlays, onlays, and full coverage restorations. Scanners to be available in the cubicles and milling machines placed in the lab or designated area in the clinic.

RATIONALE – Introduce the students to digital impressions as the service offers benefits to both the clinician and the patient. They reduce clinical visits, treatment cost, and increase convenience and comfort for the patients.

CBCT

The CBCT will be used in the clinic on a daily basis.

RATIONALE – The CBCT and its integrated software may be used, among others, for planning implant placement, designing a surgical template, diagnose existing problems, etc.

DIGITAL RADIOGRAPHY

The digital X-ray sensors will be used in the clinic on a daily basis.

RATIONALE

1. Reduce radiation
2. Increase speed, and therefore comfort for the patient
3. Improve quality of the images
4. Ability to manipulate the images

INTRAORAL CAMERA WAND

The intraoral camera will be used in the clinic as part of the diagnosis and treatment planning.

RATIONALE

1. Better communication with the patient, helping them understand their problem and take ownership of the treatment
2. Patient education
3. Early detection of lesions
4. Motivating the patient
5. Help with third-party payment

SHADE SELECTION DEVICES

The shade selection devices will be used in the clinic in conjunction with the regular shade guides.

RATIONALE

1. More uniform and precise communication with the Laboratory Technician
2. Improve motivation, compliance and cooperation of the patient
3. Help compensate for eye fatigue
4. Aid selection with difficult color matches
5. Compensate for defective color vision

CARIES DETECTION DEVICES

The caries detection devices will be used in the clinic as part of the diagnosis and treatment planning.

RATIONALE

1. Individualized patient care
2. Early caries detection during initial examination or recall exam
3. Identify patient at high risk
4. Allows for minimally invasive dentistry

TECHNOLOGY EQUIPMENT TO BE INTRODUCED – PRE-PATIENT

PRECANCEROUS SCREENING

Students could try precancerous screening devices on each other during training.

RATIONALE – Introduce the students to the concept of precancerous screening as part of the routine oral exam in order to convey the importance of early detection and prevention of oral cancer.

INTRODUCTION TO DIGITAL IMPRESSIONS

Students will be exposed to the intraoral scanning system in order to learn how to scan, design, and mill all-ceramic restorations.

RATIONALE

- Introduce the students to digital impressions as the service offers remarkable benefits to both the clinician and the patient. They reduce clinical visits, treatment cost, and increase convenience and comfort for the patients.
- Possibility to use software that assists with evaluation of students' typodont preparations.
- Assist students with understanding parameters for teeth preparations (guidelines for reduction, margin widths, detection of undercuts) and calibration for grading during practicals.

INTRODUCTION TO CBCT

The topic can be introduced in radiology courses or others in the second year of dental school. Interpretation of the CBCT should be taught when students import the DICOM files into a software program that requires them to read the scan, measure the bone, locate vital structures, and plan for implant placement.

INTRODUCTION TO DIGITAL RADIOGRAPHY

The topic can be introduced in radiology courses or others in the second year of dental school. Use of the sensors should be taught on dummies, or students can practice taking X-rays for each other.

RATIONALE

1. Reduce radiation
2. Increase speed, and therefore comfort for the patient
3. Improved quality of the images

INTRODUCTION TO INTRAORAL CAMERA WAND

The topic could be introduced in the first or second year of dental school.

RATIONALE

1. Better communication with the patient, helping them understand their problem and take ownership of the treatment
2. Patient education
3. Early detection of lesions
4. Motivating the patient
5. Help with third-party payment
6. Part of patient's digital record (*pre- and post-treatment*)
7. Education for students and part of students' digital portfolio for case presentation.

INTRODUCTION TO SHADE SELECTION DEVICES

The topic could be introduced in the second or third year of dental school.

RATIONALE

1. More uniform and precise communication with the Laboratory Technician
2. Improve the patient's motivation, compliance, and cooperation
3. Part of patient's digital dental record

RESOURCE DEVELOPMENT

TECHNOLOGY EQUIPMENT TO BE INTRODUCED – PRE-PATIENT (CONT'D)

INTRODUCTION TO CARIES DETECTION DEVICES

The topic could be introduced in the second or third year of dental school. Students can practice on each other in the pre-patient courses.

RATIONALE

1. Individualized patient care
2. Early caries detection during initial examination or recall exam
3. Identify patient at high risk (*CAMBRA evaluation*)
4. Allows for minimally invasive dentistry

FACULTY/STAFF TRAINING GROUP DISCUSSION

CODA requires that dental schools “regularly assess their use of technology and explore new applications of technological advances to enhance student learning and to assist faculty as facilitators of learning and designers of learning environments.” Establishing an effective digital dentistry curriculum requires competent faculty and staff to engage students and to foster the program’s growth within the school. It is paramount that systems be put in place to insure continuous educational opportunities for faculty and staff. Customized programs will be required for each institution after an assessment of needs. Faculty present with various levels of interest and experience in digital dentistry. By formalizing a university digital dentistry training program, students can expect a more uniform learning experience and expedited use of the technology, which will enhance the delivery of quality patient care. One added benefit of faculty and staff training is improving the skill sets and self-esteem for individual employees. This can provide an enhanced work environment which reduces turnover.

In order to achieve this goal we must map out strategies for faculty and staff training. One goal would be to establish a generalized training program that could be customized by each school. Identifying institutions that currently have systems in place and are willing to help others is a great start. We can work with corporate partners willing to support this effort. Creating mentor groups, partnerships and teams reduces redundancy and affords enhanced learning from the experienced teachers. Several ideas presented and discussed by working group include the development of teaching modules for use by students, faculty

and staff. Case based teaching is possible with printed models, video tutorial and self assessment of outcomes. A web-based application or website is currently being created at one university that will train CAD/CAM users by aggregating learning materials from various sources (preparation design, material selection, scanning, designing, milling and customization of restorations). Additional resources should foster curriculum development, student assessment, workflow timelines and tips.

The Faculty Training Group survey dispensed to Task Force members revealed that most members prefer one-on-one training and lunch and learn programs for faculty development. “Lesson in a box”, a teaching module containing a clinical case model with directions and self assessment were also preferred because of constant and immediate availability. Utilizing time during faculty meetings for brief technology updates (i.e.: software or hardware updates, etc) delivers usable information in a precise and usable dose. Off-site training was the least effective and most expensive.

Faculty can be held accountable for learning and mastery through competency testing. An OSCE is an effective way to measure training outcomes. Students will expect faculty and staff to be knowledgeable and helpful instructors. This creates a demand for learning as well.

ACP is working on Faculty Development and Training Strategies, and will share as the Curriculum Development Plan is introduced to the oral health educational community. We recognize the critical nature of preparing faculty and developing the expertise, and look forward to partnering with the educational institutions.

POST-GRADUATE/ADVANCED PROSTHODONTICS

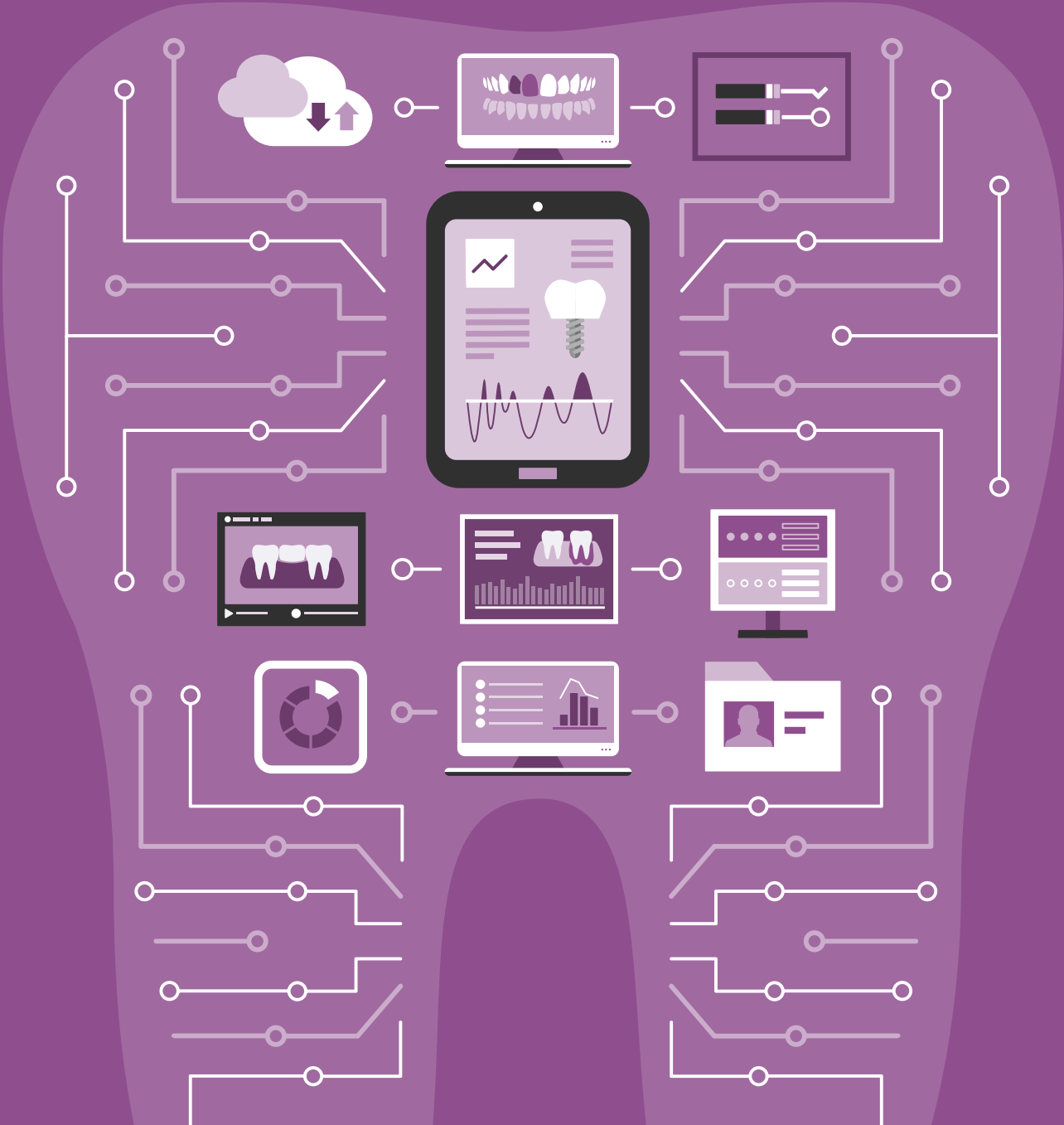
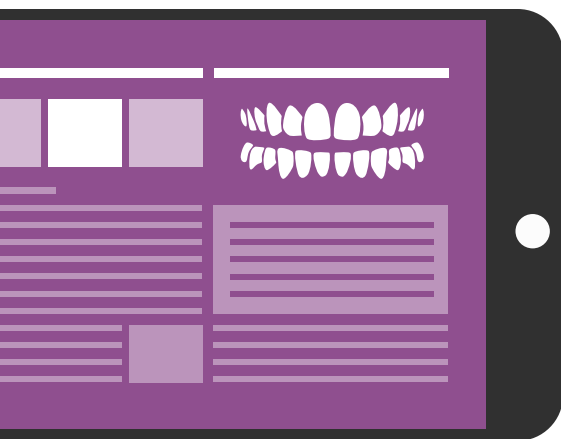


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INTRODUCTION

The evolution of the art and science of dentistry has always been gradual and steady, driven primarily by innovations and new treatment protocols that challenged the conventional wisdom. The invention of the turbine handpiece and the introduction of dental endosseous implants are clear examples of this. While major innovations in dentistry have been few and far between, the recent explosion in digital technology, software, scanning and manufacturing capabilities has triggered an unparalleled revolution leading to a major paradigm shift in all aspects of dentistry. Not only is digital radiography currently utilized in many dental clinics, but virtual planning and computer-aided design and manufacturing (CAD/CAM) are also becoming mainstream. Digital impressions, digitally fabricated dentures, and the virtual patient are no longer science fiction but are, indeed, a reality.



This course is intended to be comprehensive in nature and inclusive of all areas of advanced digital dentistry in prosthodontics. It may be used as one continuous course, or divided into sections that are integrated into an existing advanced prosthodontics curriculum. The following is a suggested digital curriculum including didactic and hands-on components. All efforts should be made to update session materials and to provide the most advanced technologies that have an evidence base. Continuous evaluation of the best available evidence is incorporated throughout this course.

Advanced Prosthodontics – Digital Dentistry

COURSE SECTION

I. INTRODUCTION TO DIGITAL PATIENT CARE

COURSE OVERVIEW

This section will provide an overview of various digital technologies available for assessment, diagnosis, treatment planning, and treatment of the advanced prosthodontics patient.

LEARNING OBJECTIVES

1. To understand available digital technologies for advanced prosthodontics assessment, diagnosis and treatment planning.
2. To be familiar with advanced diagnostic digital technologies (e.g. mandibular recording devices and jaw motion tracking systems).
3. To understand how the electronic patient health record (EHR) integrates with assessment, diagnosis and treatment planning digital technology.

COURSE SECTION

II. SINGLE-UNIT, TOOTH-, AND IMPLANT-SUPPORTED PATIENT CARE

COURSE OVERVIEW

This section of the course is designed to provide residents with the instruction and experience necessary to become competent in providing care using digital technologies for the digital evaluation, design and fabrication of tooth- and implant-supported, single-unit restorations for dentate and partially edentulous patients.

LEARNING OBJECTIVES

1. Application of digital technologies for assessment, diagnosis, and treatment planning
2. Create and evaluate digital models and digital designs
3. Master intraoral optical impressions
4. Perform extraoral digital scans
5. Perform appropriate tooth preparations for digitally designed single-unit tooth prostheses
6. Select appropriate material for digitally designed and fabricated single-unit, tooth- and implant-supported prostheses
7. Perform self assessment and make appropriate adjustments to the digital designs and final prostheses
8. Modify and assess the esthetic and functional outcomes of treatment at completion of therapy and at periodic intervals

COURSE SECTION (CONT'D)

II. SINGLE-UNIT, TOOTH-, AND IMPLANT-SUPPORTED PATIENT CARE

LEARNING OBJECTIVES (CONT'D)

9. Digitally assess, diagnose, and plan single-unit, implant-retained prostheses using guided surgery planning software
10. Create laboratory prescriptions
11. Facilitate CAD/CAM production of restorations for single-unit tooth and implant prostheses using subtractive and additive manufacturing technologies
12. Accurately assess and modify the esthetic and functional outcomes of prostheses
13. Select and utilize proper insertion procedures
14. Self-assess the clinical outcomes

COURSE SECTION

III. FULL ARCH TOOTH-SUPPORTED AND IMPLANT-SUPPORTED PATIENT CARE

COURSE OVERVIEW

This course section aims to equip residents with the training and experience necessary to become competent in using digital technologies for the evaluation, design, and fabrication of full arch implant-supported prostheses.

LEARNING OBJECTIVES

1. Application of digital technologies for assessment, diagnosis, and treatment planning of full arch implant-supported prostheses (e.g., optical impressions, CBCT, digital photos).
2. Identify indications and limitations of digitally planned, designed, and fabricated full arch implant-supported prostheses.
3. Understand the different digital workflows available for the planning, design, and manufacture of full arch implant-supported prostheses.
4. Perform intraoral and extraoral scanning for implant-supported restorations.
5. Application of digital technology to plan and design the various types of surgical templates.
6. The use of digital technology for planning, designing, and fabrication of provisional implant-supported restorations utilizing various loading protocols.
7. Perform self assessment using digital technology to evaluate plans, designs, and provisional restorations for full arch implant-supported prostheses.
8. Evaluate digital models and proposed digital designs for full arch implant-supported prostheses.
9. Select appropriate material for digitally designed and fabricated full arch implant-supported prostheses.
10. Perform self assessment and make appropriate adjustments to the digital designs of full arch implant-supported prostheses.
11. Create laboratory prescriptions for digitally designed full arch implant-supported prostheses.
12. Accurately assess and modify the esthetic and functional outcomes of the full arch implant-supported prostheses. Select and utilize proper insertion procedures.
13. Self-assess the clinical outcomes.

COURSE SECTION**IV. AND V. REMOVABLE PROSTHETICS PATIENT CARE – COMPLETE AND PARTIAL DENTUREE****COURSE OVERVIEW**

These course sections aim to equip residents with the training and experience necessary to become competent in using digital technologies for the digital evaluation, design and fabrication of removable prostheses for partially and completely edentulous patients.

LEARNING OBJECTIVES

1. Understand the use of digital technologies to identify, evaluate, and diagnose normal anatomic features necessary for the fabrication of digital removable prostheses.
2. Acknowledge the presence of several manufacturers for the fabrication of digital complete and partial dentures and be familiar with the workflow for each manufacturer.
3. Understand the key differences between digital and analogue workflow for fabricating removable prostheses, and understand the advantages and disadvantages of each technique.
4. Select the appropriate technology and materials for the fabrication of definitive impressions for removable prostheses.
5. Properly identify the centric occlusion position and the vertical dimension of occlusion.
6. Understand the various methods of internal and external communication for digital removable prostheses.
7. Recognize the anatomic guidelines for tooth positioning.
8. Effectively self-assess and make appropriate recommendations to a digital designer for removable prostheses.
9. Select and utilize proper insertion procedures.
10. Self-assess the clinical outcomes of digital removable prostheses.

CURRENT LITERATURE REVIEW SESSIONS

Current literature reviews will be scheduled as an ongoing supplement to each section of the course. Literature will be provided to the residents by the course director per course schedule. Each resident will be responsible for article review and analyses as assigned.

EVIDENCE-BASED REPORTS

Each resident will be required to submit an evidence-based report at the end of the course on a topic mutually agreed upon with the course director. This report should address a PICO question and should cover a treatment situation relevant to the course. Course directors may choose to have each student do multiple reports over the period of the residency program.

COURSE MATERIALS

- WEB PAGE OR BLACKBOARD AS INDICATED*
- REQUIRED READING MATERIALS*
Literature review articles as assigned.
- RECOMMENDED (OPTIONAL) TEXTS OR OTHER MATERIALS
 - ▶ *Clinical Applications of Digital Dental Technology*, R. Masri, C. Driscoll. John Wiley and Sons, 2015.
 - ▶ *Glossary of Digital Prosthodontic Terms*, *Journal of Prosthodontics*, 2016

COURSE REQUIREMENTS, METHODS OF EVALUATION, AND GRADING POLICIES

EVALUATION CRITERIA*

Course participants are expected to attend all sessions and be prepared with any reading assignments or discussion. Participants are required to complete all assignments, exams, and self assessments.

FINAL EVALUATION*

Course participants will be evaluated by the following methods:

WRITTEN EXAMINATION
(Essay or multiple choice questions)

HANDS-ON PROJECTS

EVIDENCE-BASED PROJECT

SELF ASSESSMENT

COURSE SCHEDULE

SESSION	SEMINAR	HANDS-ON
SECTION I: INTRODUCTION TO ADVANCED DIGITAL PATIENT CARE		
1	Course Introduction: Advanced Digital Dentistry Overview	N/A
2	Electronic Health Record for the Complex Patient	Electronic Health Record
3	Assessment and Diagnostic Instruments for Complex Prosthodontic Patients I: Overview	N/A
4	Assessment and Diagnostic Instruments for Complex Prosthodontic Patients II: Digital Photography	Digital Photography
5	Assessment and Diagnostic Instruments for Complex Prosthodontic Patients III: Mandibular Recording Devices and Virtual Articulation	MRD and Virtual Articulators
6	Assessment and Diagnostic Instruments for Complex Prosthodontic Patients IV: Jaw Motion Tracking	Jaw Motion Tracking

(Continues on next page)

*The course can be pass/fail or there can be grades issued. If the course is integrated into other courses, it will assume the evaluation methods of the parent course.

COURSE SCHEDULE (CONT'D)

SESSION	SEMINAR	HANDS-ON
7	Assessment and Diagnostic Instruments for Complex Prosthodontic Patients V: Facial Scanning	Facial Scanning
SECTION II: SINGLE-UNIT, TOOTH-, AND IMPLANT-SUPPORTED PATIENT CARE		
1	Assessment, Diagnosis, and Treatment Planning: Single-Unit Tooth Restorations	N/A
2	Preparation Design and Occlusal Considerations for All-Ceramic Restorations	Tooth Preparations
3	Selection and Mechanical Properties of CAD/CAM Restorative Materials	Continue with Tooth Preparations
4	Intraoral Scanning: Basics and Types of System	Simulated Patient Intraoral Scans
5	CAD/CAM Systems: Scan and Design	Simulated Patient Intraoral Scan and Design
6	Esthetics and Color: Maximizing Esthetics Using Veneering, Characterization, and Staining	Characterization and Staining
7	Current Literature Review	Evidence-Based Project
8	Assessment and Diagnosis and Treatment Planning for Single-Unit, Implant-Supported Restorations	CBCT and Guided Surgery Planning
9	Single Tooth Implant Placement Using Guided Surgery	Guided Surgery
10	Digital Implant Impressions	Simulated Patient Scans
11	Custom Abutments Using a Complete Digital Workflow	Custom Abutment and Crown Fabrication
12	Current Literature Review	Evidence-Based Project
SECTION III: FULL ARCH IMPLANT-SUPPORTED PATIENT CARE		
1	The Use of 3-Dimensional Radiography and Digital Models for Diagnosis and Treatment Planning of Implant Surgery	Implant Planning and Cast Scans
2	Surgical Templates: Types, Designs, and Fabrication	Design and Fabrication of Surgical Templates
3	Implant Placement: Available Techniques, Guided Surgery, Flapless Surgery	Implant Placement on Simulated Patient

(Continues on next page)

COURSE SCHEDULE (CONT'D)

SESSION	SEMINAR	HANDS-ON
4	Full Arch Implant-Supported Prosthesis: Provisional Restorations	Provisional Restoration and Prosthesis Conversion
5	Full Arch Implant-Supported Prosthesis: Materials and Mechanical Properties	Continue Provisional Restoration and Conversion
6	Full Arch Implant-Supported Prosthesis: Design Principles	Abutment and Bar Design
7	Full Arch Implant-Supported Prosthesis: Insertion and Maintenance	Complete Bar Designs
8	Current Literature Review: Full Arch Implant-Supported Prosthesis	Evidence-Based Project

SECTION IV: COMPLETE DENTURE REMOVABLE PROSTHETICS PATIENT CARE

1	Introduction to CAD/CAM Digital Complete Dentures	N/A
2	Complete Digital Dentures: Muscles and Structures that Form Denture Borders	Start Digital Denture Patient
3	Impression and Scanning Techniques, and Materials	Continue DD Patient ▶ <i>Final Impressions</i>
4	Anatomic and Esthetic Guidelines for Tooth Positioning in Digitally Designed Dentures	Continue DD Patient ▶ <i>Tooth Setup and Design</i> ▶ <i>Lab Prescriptions</i>
5	Determining the Rest Position, OVD, and Recording Centric Relation in Digitally Designed Dentures	Continue DD Patient ▶ <i>Evaluate Denture</i>
6	Final Denture Insertion and Adjustments	Complete DD Patient ▶ <i>Final Insertion</i>
7	Current Literature Review: Digital Complete Dentures	Evidence-Based Project

SECTION V: PARTIAL DENTURE REMOVABLE PROSTHETICS PATIENT CARE

1	Introduction to CAD/CAM Digital Partial Dentures: Diagnostic and Treatment Planning Essentials	N/A
2	Fundamentals of RPD Design Using a Digital Workflow	Simulated Patient RPD ▶ <i>Preparation</i>
3	Materials, and Impression and Scanning Techniques for Digital Partial Dentures	Simulated Patient RPD ▶ <i>Impression and Scans</i>

(Continues on next page)

COURSE SCHEDULE (CONT'D)

SESSION	SEMINAR	HANDS-ON
4	Digital Partial Denture Framework Design and Fabrication	Virtual Framework Design and Printing
5	Forming Prosthesis Bases, Mounting Casts, and Tooth Setup	Denture Teeth Setup and Processing
6	Clinical Placement and Post-Placement Care	Framework Fitting and Finishing
7	Current Literature Review (Digital Partial Dentures)	Evidence-Based Project

Advanced Prosthodontics – Digital Dentistry

COURSE OUTLINE

SECTION I: INTRODUCTION TO ADVANCED DIGITAL PATIENT CARE

SESSION	SEMINAR	HANDS-ON
1	<p>Course Introduction: Advanced Digital Dentistry Overview</p> <p>The purpose of this seminar is to provide an overview of the various types of digital technology and their specific indications for advanced prosthodontics. It should include a general discussion of what digital dentistry is, how it can be applied to advanced prosthodontics, and how it can benefit advanced patient care. It should include the following information:</p> <ul style="list-style-type: none"> ▶ <i>History of Digital Dentistry</i> ▶ <i>Imaging (Intraoral, CBCT)</i> ▶ <i>Diagnosis and Treatment Planning</i> ▶ <i>Implant Surgical Guides and Surgery</i> ▶ <i>Custom Abutments</i> ▶ <i>Lab-Based Scanning</i> ▶ <i>Intraoral Scanning</i> ▶ <i>CAD/CAM Restorations</i> ▶ <i>Complex Restorations and Bars</i> ▶ <i>Removable Prosthetics</i> 	N/A
2	<p>Electronic Health Record for the Complex Patient</p> <p>The purpose of this seminar is to discuss the electronic health record (EHR) for the complex patient and explore how digital technology is (or should be) incorporated within the EHR. The EHR is important for all patients, but it is especially important for complex prosthodontic patients. As new technology emerges, we must find ways to ensure it is collected in a uniform, comprehensive and useful way. The potential for collaboration and integration of diagnostic digital technologies with other specialties will be explored. A discussion of HIPAA compliance and the storage of digital patient files should be included in this session.</p>	Residents should be given training and exercises to learn how digital scan technologies and digital imaging is incorporated into the EHR. This would include experiences with the manipulation of digital radiographs, accessing intraoral scans, and other technologies. They should also learn where and how to store digital patient data files in their institution.
3	<p>Assessment and Diagnostic Instruments for Complex Prosthodontic Patients I: Overview</p> <p>The purpose of this seminar is to introduce residents to advanced technologies that can be used for the assessment and diagnosis of the prosthodontic patient. Specifically, new and emerging technologies for patient evaluation, occlusal analysis, and esthetic evaluation should be included. Subjects such as digital photography, mandibular recording devices, jaw motion tracking systems, and facial scanning should all be discussed here.</p>	N/A

(Continues on next page)

COURSE OUTLINE (CONT'D)

SECTION I: INTRODUCTION TO ADVANCED DIGITAL PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
4	<p>Assessment and Diagnostic Instruments for Complex Prosthodontic Patients II: Digital Photography</p> <p>The purpose of this seminar is to introduce residents to advanced technologies in digital photography. Specific digital photographic techniques for multiple complex patient scenarios should be included. This is an important step in the diagnosis, assessment, prognosis, and outcomes evaluation for prosthodontic patients. It is also crucial in providing accurate, detailed, and well-imaged documentation for the American Board of Prosthodontics examination.</p>	<p>Residents will obtain hands-on experience with the latest technologies in digital photography. This should include specifics on camera settings, use of flashes, intraoral and extraoral photography, and light manipulation. This should include hands-on practice, as well as instructor evaluation and self-evaluation.</p>
5	<p>Assessment and Diagnostic Instruments for Complex Prosthodontic Patients III: Mandibular Recording Devices and Virtual Articulation</p> <p>The purpose of this seminar is to introduce residents to advanced technologies for evaluating prosthodontic patients. Specifically, new and emerging technologies for mandibular recording devices and virtual articulation will be discussed. Learning how to record mandibular jaw movements and utilizing virtual articulation will become more important in the future for digital workflows in assessing, diagnosing, and treatment planning for complex patients. This technology will evolve quickly. This session should reflect the most current and best technologies available.</p>	<p>Residents will obtain hands-on experience with the latest diagnostic technologies for mandibular recording and virtual articulation.</p> <ul style="list-style-type: none"> ▶ <i>Mandibular Recording Devices</i> ▶ <i>Virtual Articulators</i> <p><i>This may require multiple sessions.</i></p>
6	<p>Assessment and Diagnostic Instruments for Complex Prosthodontic Patients IV: Jaw Motion Tracking</p> <p>The purpose of this seminar is to introduce the resident to advanced technologies for evaluating prosthodontic patients. Specifically, new and emerging technologies for jaw motion tracking should be covered here. This technology is in the early stages of development and use. However, it is currently available and may influence how occlusion and wear patterns are evaluated for complex prosthodontic patients. Jaw motion tracking will become more important in the future for digital workflows in assessing, diagnosing, and treatment planning for complex patients.</p>	<p>Residents will obtain hands-on experiences with the latest diagnostic technologies in jaw motion tracking.</p>

(Continues on next page)

COURSE OUTLINE (CONT'D)

SECTION I: INTRODUCTION TO ADVANCED DIGITAL PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
7	<p>Assessment and Diagnostic Instruments for Complex Prosthodontic Patients V: Facial Scanning</p> <p>The purpose of this seminar is to introduce the resident to advanced technologies for evaluating prosthodontic patients. Specifically, new and emerging technologies for facial scanning should be covered here. A full esthetic evaluation within this context should be included. This technology is in the early stages of development and use. However, it is currently available and may influence esthetic evaluations for complex prosthodontic patients. Facial scanning systems will become more important in the future for digital workflows in assessing, diagnosing, and treatment planning for complex patients.</p>	<p>Residents will obtain hands-on experience with the latest diagnostic technologies in facial scanning.</p>

COURSE OUTLINE (CONT'D)

SECTION II: SINGLE-UNIT, TOOTH-, AND IMPLANT-SUPPORTED PATIENT CARE

SESSION	SEMINAR	HANDS-ON
1	<p>Assessment, Diagnosis, and Treatment Planning: Single-Unit Tooth Restorations</p> <p>The purpose of this seminar is to discuss how assessment, diagnosis, and treatment planning is best accomplished for single-unit, tooth-supported digital restorations. The specific types of digital technologies available for each area should be included. Also, diagnostic imaging using digital radiographs and indications for digital restorations should be discussed.</p>	N/A
2	<p>Preparation Design and Occlusal Considerations for All-Ceramic Restorations</p> <p>The purpose of this seminar is to teach residents specific and detailed preparation design for ceramic digital restorations. Any differences between traditional tooth preparations and digital tooth preparations should be highlighted. Also, occlusal design, clearance, margin placement and depth, and material thickness requirements should be included here.</p>	<p>Tooth Preparations for Digital Restorations (Suggested)</p> <ul style="list-style-type: none"> a) Mount and equilibrate typodonts b) #3 ceramic crown c) #7 ceramic crown d) #9 ceramic crown e) #19 ceramic MOD onlay f) #8 Veneer
3	<p>Selection and Mechanical Properties of CAD/CAM Restorative Materials</p> <p>The purpose of this seminar is to discuss the various types of CAD/CAM materials available for tooth- and implant-supported restorations. This should include the selection criteria for these materials, as well as the consideration of mechanical properties including hardness, stiffness, flexural strength, and wear. Residents should be able to understand the use of these materials in the context of the patient's overall oral condition.</p>	Continue with Tooth Preparations
4	<p>Intraoral Scanning: Basics and Types of Systems</p> <p>The purpose of this seminar is to introduce various intraoral scanning technologies. The intraoral scanner of choice should be discussed in detail while preparing for use in the clinical setting. Specific details should be covered with respect to scanning basics and techniques. Ultimately, the goal should be to record intraoral diagnostic scans for every prosthodontic patient. As this technology and workflow improves, scanning every patient diagnostically will become a realistic goal.</p>	<p>Simulated Patient Intraoral Scans on Typodont</p> <ul style="list-style-type: none"> ▶ Practice scanning single teeth ▶ Full arch diagnostic scans – maxillary and mandibular typodont <p>Full Arch Scans – Patients</p> <ul style="list-style-type: none"> ▶ Residents will be paired up to perform a full arch maxillary and mandibular scan on each other

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COURSE OUTLINE (CONT'D)

SECTION II: SINGLE-UNIT, TOOTH-, AND IMPLANT-SUPPORTED PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
5	<p>CAD/CAM Systems – Scan and Design</p> <p>The purpose of this seminar is to provide in-depth training on the specific CAD/CAM systems being used. Residents should scan and design some, or all, of the preparations completed in previous hand-on sessions. They should learn how to design single-unit restorations to ideal form, function and esthetics. If multiple systems are used, there should be extensive didactic and hands-on training for each.</p>	<p>Simulated Patient Intraoral Scan and Design</p> <ul style="list-style-type: none"> ▶ Residents should scan, design, and fabricate restorations for the tooth preparations completed in previous hands-on sessions. <p>This may require multiple sessions.</p>
6	<p>Esthetics and Color: Maximizing Esthetics Using Veneering, Characterization and Staining</p> <p>The purpose of this seminar is to discuss the best methods of achieving optimal esthetics for digital restorations. This should include a review of color science and shade matching. It should also include staining methods for monolithic ceramic materials (e.g. Emax), as well as veneering of CAD/CAM ceramic materials.</p>	<p>Practice Characterization and Staining Ceramic Restorations</p> <ul style="list-style-type: none"> ▶ This should include taking the restoration from a pre-crystallized state to a crystallized state. There should also be demonstrations and practice of the entire staining and characterization process.
7	<p>Current Literature Review</p> <p>The purpose of this seminar is to discuss the pre-selected, evidence-based literature on single tooth digital restorative materials, restorations, etc. Mechanical properties, success and failure rates, and patient satisfaction should also be considered for these sessions.</p>	<p>Start Evidence-Based Dentistry Project (See Syllabus)</p> <ul style="list-style-type: none"> ▶ Using the best current evidence, answer an EBD question related to single tooth, single tooth implant, full arch, or removable prosthesis digital patient care.
8	<p>Assessment, Diagnosis and Treatment Planning for Single-Unit, Implant-Supported Restorations</p> <p>The purpose of this seminar is to discuss how assessment, diagnosis, and treatment planning is completed for single-unit, implant-supported digital restorations. The specific types of digital technology available for each area should be included. The types of digital imaging utilized in single tooth implant dentistry should be discussed in detail. CBCT should be a major focus. The specific software used in the treatment planning of single tooth implants should be covered. The merging of digital files (CBCT and intraoral diagnostic or laboratory wax-up scans) to optimize implant planning should be discussed.</p>	<ul style="list-style-type: none"> ▶ Training session on CBCT imaging, diagnosis, assessment, etc. This should be a supplement to a more extensive global training on advanced digital imaging. ▶ Residents should be given extensive training with STI scenarios on treatment plan and design for the implant planning software.

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COURSE OUTLINE (CONT'D)

SECTION II: SINGLE-UNIT, TOOTH-, AND IMPLANT-SUPPORTED PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
9	<p>Single Tooth Implant Placement Using Guided Surgery</p> <p>The purpose of this seminar is to discuss using guided implant surgery to achieve optimal implant positioning and soft tissue esthetics and management. Program specific systems should be discussed in detail. Advantages and disadvantages of guided surgery should also be discussed from an evidence-based perspective.</p>	<p>Guided Surgery Training</p> <ul style="list-style-type: none"> ▶ Residents should have a hands-on session on the surgical aspects of guided surgery. This should include placing implants in a typodont using surgery guides and protocols specific to the systems being used.
10	<p>Digital Implant Impressions</p> <p>The purpose of this seminar is to present all of the methods used to obtain a digital implant impression. Both intraoral and lab-based scanning techniques using scan bodies should be described in detail. Advantages and disadvantages of digital versus analogue impressions should be covered here.</p>	<p>Simulated Patient Scans with Scan Bodies (using implants placed in previous session)</p> <ul style="list-style-type: none"> ▶ Intraoral ▶ Lab
11	<p>Custom Abutments Using a Complete Digital Workflow</p> <p>The purpose of this seminar is to discuss the various types of custom abutments available for single tooth implants and how to navigate the specific software. The use of core files to design a crown for immediate implant placement and restoration should also be discussed. Residents should understand how to modify custom abutment designs to create optimal emergence profile, tissue health, and contours and esthetics.</p>	<p>Custom Abutment and Crown Fabrication</p> <ul style="list-style-type: none"> ▶ Residents should use the typodont to complete the process from digital impression to fabrication of a custom abutment. ▶ Abutment design software should be used to facilitate designing a custom abutment. ▶ After custom abutment is fabricated, a ceramic crown should be designed, milled, crystallized, characterized and stained to completion.
12	<p>Current Literature Review</p> <p>The purpose of this seminar is to discuss the pre-selected, evidence-based literature on STI guided surgery, custom abutments, digital impressions, etc.</p>	<p>Continue with Evidence-Based Dentistry Project (See Syllabus)</p> <ul style="list-style-type: none"> ▶ Using the best current evidence, answer an EBD question related to single tooth, single tooth implant, full arch, or removable prosthesis digital patient care.

COURSE OUTLINE (CONT'D)

SECTION III: FULL ARCH IMPLANT-SUPPORTED PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
1	<p>The Use of 3-Dimensional Radiography and Digital Models for Diagnosis and Treatment Planning of Implant Surgery</p> <p>The purpose of this seminar is to provide a comprehensive presentation on the use of 3D radiography and digital models in the planning of complex implant surgery. Various file types, merging of CBCT and digital models, and virtual implant placement for complex restorations should be discussed in detail. The various types of complex restorative options and their respective digital diagnostic workflows should be covered.</p>	<p>Residents will receive hands-on instruction on intraoral and extraoral scanning of casts for simulated patients, and they will use the CBCT's of simulated patients to plan for implant surgery.</p>
2	<p>Surgical Templates: Types, Designs and Fabrication</p> <p>The purpose of this seminar is to discuss the various types of surgical templates that can be utilized for complex implant patient care. This should include the various types of implant planning software available and should cover tooth, bone, and soft tissue templates.</p>	<p>Residents will receive hands-on instruction on digital design and fabrication of surgical templates.</p>
3	<p>Implant Placement: Available Techniques, Guided Surgery, and Flapless Surgery</p> <p>The purpose of this seminar is to present the available techniques for guided surgery. This should include digitally planned surgeries for overdenture, fixed, and fixed complete therapies. This should also include the use of surgical templates that are tooth-borne, soft tissue-supported, and bone-supported.</p>	<p>Residents will use digitally designed and manufactured surgical guides to place implants in simulated casts of patients.</p>
4	<p>Full Arch Implant-Supported Prosthesis: Provisional Restorations</p> <p>The purpose of this seminar is to present didactic information on the different loading protocols available and instruction on the digital design and fabrication of provisional prostheses for fixed complete patients. Advantages and disadvantages of a digital workflow for this type of advanced care versus analogue will be discussed and evaluated.</p>	<p>Residents will practice fabricating provisional restorations on the casts they placed implants in. This will include the digital design and manufacture of the provisional restoration and the conversion of the existing transitional restoration (e.g. existing denture).</p>

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COURSE OUTLINE (CONT'D)

SECTION III: FULL ARCH IMPLANT-SUPPORTED PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
5	<p>Full Arch Implant-Supported Prostheses: Materials and Mechanical Properties</p> <p>The purpose of this seminar is to discuss all available materials for full arch implant-supported prosthesis including metal, acrylic, ceramics, and zirconia. The advantages and disadvantages of each material should be explored and the best available evidence presented for success rates, strength, complications, and patient satisfaction.</p>	<p>Residents will continue with fabricating provisional restorations on the casts they prepared using the different materials described in the didactic lecture.</p>
6	<p>Full Arch Implant-Supported Prostheses: Design Principles</p> <p>The purpose of this seminar is to provide detailed instruction on the various designs available including advanced instruction on the use of set screws and the various bar designs and attachments. Design software should be reviewed and demonstrated. Also, effective and efficient laboratory communication should be reviewed in the context of a digital workflow.</p>	<p>Residents will perform lab scans of their converted prosthesis using scan bodies and design software to design abutments, bars, attachments, etc.</p>
7	<p>Full Arch Implant-Supported Prostheses: Insertion and Maintenance</p> <p>The purpose of this seminar is to provide instruction on how to assess and modify esthetics, function, and occlusion of the delivered full arch implant-supported prosthesis. Complications and proper maintenance protocols should also be discussed.</p>	<p>Complete bar designs for full arch implant-supported prostheses.</p>
8	<p>Current Literature Review: Full Arch Implant-Supported Prostheses</p> <p>The purpose of this seminar is to discuss the pre-selected evidence-based literature on full arch implant-supported prostheses. This should include subjects such as materials, complications, patient satisfaction, success and failure rates, and esthetics.</p>	<p>Continue with Evidence-Based Dentistry Project (<i>See Syllabus</i>)</p> <ul style="list-style-type: none"> ▶ <i>Using the best current evidence, answer an EBD question related to single tooth, single tooth implant, full arch, or removable prosthesis digital patient care.</i>

COURSE OUTLINE (CONT'D)

SECTION IV: COMPLETE DENTURE REMOVABLE PROSTHETICS PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
1	<p>Introduction to CAD/CAM Digital Complete Dentures</p> <p>The purpose of this seminar is to review the various types of digital denture technologies available for complete dentures. Advantages and disadvantages of each system should be discussed. Also, a comparison of analogue and digital complete denture fabrication procedures should be presented. Any new and emerging technologies in this area should be explored.</p>	N/A
2	<p>Review of Muscles and Structures that Form Denture Borders: Digital Considerations</p> <p>The purpose of this seminar is to review specific anatomical considerations, the muscles and structures that form complete denture borders. It will also present techniques for the optimal recording of the denture border using a digital workflow.</p>	<p>Digital Denture Patient</p> <ul style="list-style-type: none"> ▶ Residents will have a clinical hands-on digital denture patient experience. The first session will utilize established digital denture workflows for the specific system being used.
3	<p>Impression and Scanning Techniques, and Materials</p> <p>The purpose of this seminar is to present specific methods for obtaining maxillary and mandibular final impressions using a digital denture workflow. New and emergent technologies should be presented as well. Ideally, a complete digital workflow should be considered to include intraoral scanning of maxillary and mandibular tissues.</p>	<ul style="list-style-type: none"> ▶ Continue digital denture patient. ▶ Residents will learn how to make a final impression using the most current digital technology available.
4	<p>Anatomic and Esthetic Guidelines for Tooth Positioning in Digitally Designed Dentures</p> <p>The purpose of this seminar is to present the methodology to select and position teeth for digitally designed dentures. Specifics on available digital tooth libraries, tooth forms, esthetics, phonetics, and occlusion will be discussed.</p>	<ul style="list-style-type: none"> ▶ Continue digital denture patient. ▶ Complete tooth setup and design. ▶ Complete laboratory prescriptions.
5	<p>Determining the Rest Position, OVD, and Recording Centric Relation in Digitally Designed Dentures</p> <p>The purpose of this seminar is to present how to obtain proper rest position, OVD, and centric relation using various digital denture workflows.</p>	<ul style="list-style-type: none"> ▶ Continue digital denture patient. ▶ Evaluate completed denture.

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COURSE OUTLINE (CONT'D)

SECTION IV: COMPLETE DENTURE REMOVABLE PROSTHETICS PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
6	<p>Final Denture Insertion and Adjustments</p> <p>The purpose of this seminar is to review the final digital denture insertion and adjustment appointments. It should also cover any try-in appointments that are part of the digital denture workflow.</p>	<ul style="list-style-type: none"> ▶ Complete digital denture patient. ▶ Final insertion and adjustments. ▶ Clinical remount if needed.
7	<p>Current Literature Review: Digital Complete Dentures</p> <p>The purpose of this seminar is to discuss the pre-selected, evidence-based literature on digital complete denture prostheses. This should include subjects such as materials, complications, patient satisfaction, success and failure rates, and esthetics.</p>	<p>Continue with Evidence-Based Dentistry Project (See <i>Syllabus</i>)</p> <ul style="list-style-type: none"> ▶ Using the best current evidence, answer an EBD question related to single tooth, single tooth implant, full arch, or removable prosthesis digital patient care.

COURSE OUTLINE (CONT'D)

SECTION V: PARTIAL DENTURE REMOVABLE PROSTHETICS PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
1	<p>Introduction to CAD/CAM Digital Partial Dentures: Diagnostic and Treatment Planning Essentials</p> <p>The purpose of this seminar is to review the various types of digital technologies available for partial dentures. Advantages and disadvantages of each system should be discussed. Also, a comparison of analogue and digital partial denture fabrication procedures should be presented. The diagnosis and treatment planning of partial denture frameworks will be discussed in the context of a digital workflow.</p>	N/A
2	<p>Fundamentals of RPD Design Using a Digital Workflow</p> <p>The purpose of this seminar is to review the fundamentals of RPD design and explore whether or not there should be any alterations in design to facilitate the fabrication of an RPD using a digital workflow.</p>	<p>Simulated Patient RPD Preparation</p> <ul style="list-style-type: none"> ▶ Residents will learn how to properly prepare rest seats and guide planes on a typodont. They will also review framework design. This typodont will be used for the fabrication of a digitally designed RPD.
3	<p>Materials, and Impression/Scanning Techniques for Digital Partial Dentures</p> <p>The purpose of this seminar is to describe how to obtain a definitive scan and impression for a digital partial denture. Intraoral scanning is the preferred method, if the technology is available. The technique being used should be described in detail. Advantages and disadvantages should also be discussed.</p>	<ul style="list-style-type: none"> ▶ Residents will make and pour a definitive impression for an RPD. ▶ The typodont will be scanned for a definitive optical impression if the technology is available. ▶ Laboratory scanning of the definitive cast, in lieu of optical scanning, will be completed.
4	<p>Digital Partial Denture Framework Design and Fabrication</p> <p>The purpose of this seminar is to discuss how to create a partial denture design and framework using a digital workflow. Specifically, the various design and manufacturing programs will be presented and evaluated.</p>	<ul style="list-style-type: none"> ▶ Virtual design of framework. ▶ Printing of wax or resin pattern or printing of framework using a rapid prototyping machine.
5	<p>Forming Prosthesis Bases, Mounting Casts, and Tooth Setup</p> <p>The purpose of this seminar is to explain how to fabricate prosthesis bases, mount casts and arrange teeth using digital technology. The most advanced technology should be investigated and used if possible. A completely digital workflow is preferred if and when available.</p>	Denture teeth setup, processing of RPD using a digital workflow.

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COURSE OUTLINE (CONT'D)

SECTION V: PARTIAL DENTURE REMOVABLE PROSTHETICS PATIENT CARE		
SESSION	SEMINAR	HANDS-ON
6	<p>Clinical Placement and Post-Placement Care</p> <p>This session will discuss the initial placement, adjustment, and post-placement care phases of a digital removable partial denture. There should be a discussion about the entire process with relationship to RPD fabrication conventionally. Advantages and disadvantages of a digital workflow versus a conventional workflow will be addressed.</p>	<ul style="list-style-type: none"> ▶ <i>Framework fitting and finishing</i> ▶ <i>Residents may take the prosthesis to final processing if desired</i>
7	<p>Current Literature Review: Digital Partial Dentures</p> <p>The purpose of this seminar is the discussion of pre-selected, evidence-based literature on digital partial denture prostheses. This should include subjects such as materials, complications, patient satisfaction, success and failure rates, and esthetics.</p>	<p>Complete Evidence-Based Dentistry Project (<i>See Syllabus</i>)</p> <ul style="list-style-type: none"> ▶ <i>Using the best current evidence, answer an EBD question related to single tooth, single tooth implant, full arch, or removable prosthesis digital patient care.</i>

IMPLEMENTATION



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