NEVADA STATE BOARD of DENTAL EXAMINERS

PUBLIC BOOK

Continuing Education Committee Teleconference Meeting

Wednesday, September 30, 2020

6:00 p.m.

Agenda Item (4)(a)

NAC 631.257

NAC 631.257 Administration of certain neuromodulators related to *Clostridium botulinum* and dermal or soft tissue fillers: Required training; submission of proof of completion of training and certain other information with application for renewal. (NRS 631.190**,** 631.330**,** 631.391**)**

A holder of a license to practice dentistry who, pursuant to NRS 454.217, injects a neuromodulator that is derived from *Clostridium botulinum* or that is biosimilar to or the bioequivalent of such a neuromodulator or who, pursuant to NRS 629.086, injects a dermal or soft tissue filler, must:

1. Successfully complete a didactic and hands-on course of study in the injection of such neuromodulators and fillers that:

(a) Is at least 24 total hours in length;

(b) Includes at least 4 hours of didactic instruction and at least 4 hours of hands-on instruction in each of the following subjects:

(1) The use of neuromodulators that are derived from *Clostridium botulinum* or that are biosimilar to or the bioequivalent of such neuromodulators in the treatment of temporomandibular joint disorder and myofascial pain syndrome;

(2) The use of neuromodulators that are derived from *Clostridium botulinum* or that are biosimilar to or the bioequivalent of such neuromodulators for dental and facial esthetics; and

(3) The use of dermal and soft tissue fillers for dental and facial esthetics; and

(c) Is approved by the Board.

2. Include with the application for the renewal of his or her license:

(a) Proof acceptable to the Board that he or she has successfully completed the course of study required by subsection 1; and

(b) A statement certifying that each neuromodulator that has been or will be injected by the holder pursuant to NRS 454.217, and each dermal or soft tissue filler that has been or will be injected by the holder pursuant to NRS 629.086, is approved for use in dentistry by the United States Food and Drug Administration.

(Added to NAC by Bd. of Dental Exam’rs by R044-17, eff. 5-16-2018)

Agenda Item (5)(a)

WREB:
Interim Clinical Dental Exam

WREB
A National Dental and Dental Hygiene Testing Agency

WREB Dental and Dental Hygiene Licensing Examination COVID-19 Options for 2020

WREB is an independent testing agency that develops, administers, and reports the outcome of practical clinical examinations administered to candidates for licensing in dentistry and dental hygiene. While aware of the needs of students and dental education programs, WREB's sole purpose is to provide state boards with examinations that have high reliability and are supported by a strong validity argument—examinations state boards can rely on to inform licensing decisions. For this reason, WREB is highly responsive to the needs and wishes of state boards that recognize its examinations.

- WREB Dental Examination options are described below (pp. 1-4).
- WREB Dental Hygiene Examination options are described on pp. 5-6.

WREB Dental Licensing Examination COVID-19 Options for 2020

Following are options state boards could consider in response to COVID-19:

Dental Examination without Change

WREB's standard dental examination which includes two simulations (Endodontics and Prosthodontics) and two patient-based sections (Operative Dentistry and Periodontics) in addition to the Comprehensive Treatment Planning (CTP) section will continue to be offered as soon as test sites again are able to schedule this type of examination. This option may not address the needs of state boards attempting to respond to the concerns of dental candidates and schools who wish to complete the licensure process within the next several months. Even when re-established, examination administration may be subject to interim restrictions. States that specifically require two patient-based restorative procedures and wish to reduce the burden on licensure candidates imposed by COVID-19 could safely accept WREB's Operative Section as it is scored and validated, which has demonstrated that candidate competency can be reliably assessed with more than 40% fewer patient-based procedures.[i]

CTP Only

WREB's CTP (Comprehensive Treatment Planning) Section[ii] is an ASCE (Authentic Simulated Clinical Examination) which requires the candidate to construct responses (as opposed to an OSCE in which the candidate selects responses from options, locations, or choices provided). The CTP ASCE is open-ended and graded by independent, anonymous examiners. It reveals candidate thinking and requires candidates to perform tasks that dentists perform and to make decisions that dentists make, all without choices they can select or cues of any kind. If acceptance of only an OSCE examination is being considered, then acceptance of WREB's CTP ASCE which is an even more authentic demonstration of relevant candidate knowledge, skill, and ability, should be considered.

COVID-19 Alternative Performance-based Simulation

Patient-based assessment has high fidelity. WREB is not abandoning patient-based assessment but continues to evaluate the validity and viability of assessment alternatives, including simulation. WREB has been developing simulations that soon may be able to replace patient-based assessment for Operative Dentistry and Periodontics, the last two patient-based sections of its current dental examination. These simulations are in development and undergoing review.

In the meantime, the advent of COVID-19 has placed students and their education programs in a difficult and frustrating position. Students need to graduate, move on, obtain employment, or begin their advanced dental education residencies; their education programs need them to graduate and move on in order accept a new entering class and appropriately advance the classes below them. COVID-19 associated risk and social distancing currently completely obstruct student ability to challenge the traditional, patient-based examination. While WREB understands that COVID-19 is creating a crisis for students, for dental education programs, and even for the profession, its singular purpose is to support the needs of state boards in their regulatory role and charge to protect the public.

Students and program directors recently have appealed to state boards and, not knowing exactly how long COVID-19 risk and need for social distancing might continue, state boards in a few states now have appealed to WREB for potential solutions they might consider along with suggestions they've received that include waiving clinical examination requirements altogether, waiving the patient-based sections of the clinical examination, granting a provisional license until the applicant is able to complete the full examination, acceptance of the DLOSCE in lieu of a practical demonstration of clinical skills, and variations of these.

In response and in addition, WREB has field-tested an alternative, performance-based simulation that could be required in lieu of its traditional patient-based Operative Section. This alternative included the field-testing of social distancing for both candidates and examiners.

In the simulation, each candidate is required to successfully perform both preparation and finish of a conventional Class II restoration on a molar and a Class III restoration on a central incisor. All procedures are performed, like they are for the Endodontics and Prosthodontics sections, in full simulation and with rubber-dam isolation. Results are assessed using established Operative Section criteria. Certain critical errors are preserved, and the passing cut-point remains unchanged. The simulation involves social distancing for both candidates and examiners and uses materials (simulation teeth and arches) which are readily available and with which candidates and their programs already are familiar.

This alternative for the Operative Section is intended to be a provisional solution for 2020 (COVID-19) only and is intended neither to replace WREB's patient-based Operative Section in 2020 for states that continue to require it nor to be the simulation WREB intends to offer in the future

when social distancing is not a concern and the validity of a more realistic and involved simulation can be demonstrated.

The second patient-based section of the current WREB dental examination is the Periodontics Section. This section assesses a candidate's understanding of periodontal diagnosis and ability to physically perform initial periodontal therapy (periodontal scaling and root-planing). However, this section already is elective, is not required for licensing in some states, and tests a physical skill that, increasingly, dentists do not themselves perform.[iii] The Periodontics Section, while valued by many states, is, by far, the least discriminating section of the entire examination.[iv] Also, important aspects of periodontal diagnosis and treatment decision-making (things dentists do and are expected to know how to do) already are well covered in the unique CTP Section of WREB's dental examination. State boards may decide to waive or postpone the patient-based Periodontics section until such time as it again may become available to applicants.

These are dental examination options that WREB currently is making available for state board consideration in this highly unusual year. It is assumed that any waiver or exception a state grants due to COVID-19 might be restricted to matriculated students of CODA accredited dental education programs graduating in the spring of 2020 and would not necessarily set a precedent for future years or apply to any other group of applicants. WREB recognizes that all these and related decisions reside with the state and depend on the Board or on the Board's advice to the state authority empowered to grant a variance due to current, emergent COVID-19 circumstances.

Logistic detail regarding the implementation of WREB's dental examination or any of the described alternatives depends on the capacity, limitations, and COVID-19 restrictions imposed by or on any host site where an examination is conducted.

WREB's standard dental examination which includes the fidelity associated with two simulations (Endodontics and Prosthodontics) and two patient-based sections (Operative Dentistry and Periodontics) in addition to CTP will continue to be offered as soon as test sites again are able to host this type of examination.

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[i] Fewer patient-based procedures were required to determine 4,457 candidate pass/fail outcomes for the Operative Section in 2018 (42.0% fewer) and 2019 (41.1% fewer). No significant difference was found between first and second procedure performance for candidates who scored at or above the cut-score on the first procedure. The second procedure added no significant contribution to the assessment of these candidates. Only four of these candidates failed the section despite demonstrating competence on the first procedure; all four scored close to the cut-score and three have already passed upon retake.

[ii] The CTP Section is the most comprehensive section of the WREB Dental Examination. It tests candidate knowledge, skills and abilities that cannot be readily sampled in other ways and includes assessment of meaningful aspects of every other section of the Examination. The CTP Section is designed to integrate the disciplines of dentistry in a practical, clinical way. The construction of appropriately sequenced treatment plans and item responses requires broad understanding of diagnostic, preventive and restorative dentistry, of endodontics, periodontics, and prosthodontics, as well as oral surgical, radiological, pediatric dentistry, and patient-management procedures, and understanding of the relationships between these procedures and their clinical application under various patient conditions.

The CTP Section is open-ended; it's an authentic simulated clinical examination (ASCE)—a practical, performance-based examination. It requires candidates to construct their responses unaided by cues, choices, or locations they can select. In many instances it requires candidates to perform the very tasks dentists perform and, for this reason, has extraordinary fidelity for a computer-based examination. Rigorous examiner training and calibration contributes to high outcome reliability for the CTP examination. And the large reservoir of examination cases, frequent case modification, and the permutation of cases in the forms used every year significantly enhance test security for the CTP examination. All combine to create a strong validity argument for using results of WREB's CTP examination to inform licensing decisions.

[iii] In 2013 74.6% of general practitioners in solo practice employed one or more dental hygienists. For general practitioners in nonsolo practice (including various forms of group practice, "corporate" practice, etc.) 92.2% work in situations where dental hygienists perform scaling and root-planing services. -ADA, Science and Research – Health Policy Institute, Data Center, Dental Practice.

Authors Thomas Wall, M.A., M.B.A.; Albert H. Guay, D.M.D. in their article *Very Large Dental Practices Seeing Significant Growth in Market Share*. Health Policy Institute – Research Brief. August 2015. Point out that:

- From 2002 to 2012, market share increased for dental firms with 20 employees or more, while dental firms with fewer than five employees experienced a decline in market share.
- During the same period, very large dental firms – those with 500 employees or more – also saw increases in number of establishments, number of employees and annual receipts.

The national 2018 Dental Practice Analysis conducted jointly by WREB and CRDTS suggests that dentists, themselves, now are performing very few scaling and root-planing procedures compared to dental hygienists. The 2017 Dental Hygiene Practice Analysis survey specifically asked how often certain procedures were performed by the dentist and 84.6% of respondents said the dentist performed these tasks Rarely or Never.

The average of all general dentists employing dental hygienists in 2013 was 77.2%. From 1990 to 2013 the average number of dental hygienists per dentist in the primary practice (among dentists employing dental hygienists) steadily increased. This trend has been continuing. More and more dentists are having dental hygienists perform basic periodontal services and are using more dental hygienists per capita to do this. Dentists, themselves, are doing fewer and fewer of these tasks. Assessing these skills for dentists, now, may not be supported by the practice (task) analyses that underpin the design of a valid dental licensing examination.

[iv] Evidence in favor of non-requirement includes exceptionally high proportions of candidates performing extremely well on the Periodontics section. Most of the candidates who do fail the Periodontics section multiple times have also failed at least one other section multiple times. Only four (4) out of almost 13,000 (i.e., 0.03%) candidates from 2011 to 2016 remained unsuccessful due to Periodontics Section failure.

WREB Dental Examination Options Under COVID-19

Option	Exam Type	Description	Availability
WREB Comprehensive Treatment Planning Exam	Written Authentic Simulated Clinical Examination(ASCE)	Constructed response exam requiring students to perform tasks and make decisions with high fidelity to dental practice. For states considering an OSCE examination only as a pathway to licensure WREB's CTP ASCE is a more authentic demonstration of relevant candidate knowledge.	Most candidates completed this exam in the Fall of 2019. For those that have not, they can complete it as soon as Prometric Testing Centers open again. Projected to be May 1, 2020.
Traditional WREB Patient Based Examination	Traditional exam requiring demonstration of skills on a mannikin for Endodontic and Prosthodontics and on a patient for Periodontics and Operative and the written CTP (ASCE) exam.	Although many states require completing two procedures for the Operative section WREB has demonstrated that candidate competency can reliably assessed with 1 patient. For states that require 2 procedures currently they could relax the requirement to require only one procedure.	Depends on the event line of COVID-19; circumstances will vary widely across sites and require willing patients and available volunteers, freedom of air travel, available lodging, etc.
COVID-19 Alternative Performance Based Simulation	Written Authentic Simulated Clinical Examination(ASCE) exam and mannikin based Operative, Endodontics and Prosthodontics sections	Candidate is required to successfully perform both preparation and finish of a conventional Class II restoration on a molar and a Class III restoration on a central incisor. All procedures are performed, like they are for the Endodontics and Prosthodontics sections, in full simulation and with rubber-dam isolation. Results are assessed using established Operative Section criteria. Certain critical errors are preserved, and the passing cut-point remains unchanged.	Can begin as soon as June depending on CDC recommendations, local conditions, etc. Will be administered utilizing appropriate social distancing protocols

WREB Dental Hygiene Examination Options Under COVID-19

Option	Exam Type	Description	Availability
Dental Hygiene Clinical Examination	Patient Based Examination	WREB's standard dental hygiene examination includes the following components: Patient Qualification; Extraoral/Intraoral examination, Calculus detection and removal, Tissue Management, Periodontal Assessment and Professional Judgment.	Depends on the event line of COVID-19; circumstances will vary widely across sites and require willing patients and available volunteers, freedom of air travel, available lodging, etc.
Comprehensive Dental Hygiene OSCE	Written Exam	The WREB Dental Hygiene OSCE is a multiple-choice written component that assesses these multi-faceted components of dental hygiene care. This is a comprehensive overview of dental hygiene knowledge, radiographic interpretation, AAP staging and grading, extra and intra oral assessment and risk assessment, care plan development, and assessment and treatment of the periodontium. The exam is an avenue to test the skills of an entry-level student, either replacing either replacing the current clinical examination or to be administered in conjunction with a clinical licensure exam should a state board want an additional assessment examination.	Can be administered beginning in June of 2020.

WREB
A National Dental and Dental Hygiene Testing Agency

WREB Interim Clinical Dental Examination:

COVID-19 Performance-Based Simulation Examination

Psychometric Overview

May 6, 2020

WREB Interim Clinical Dental Examination:
COVID-19 Performance-Based Simulation Examination
Psychometric Overview

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Psychometric Overview

Introduction

Results from standardized assessments are one source of evidence used by licensing bodies to make decisions about a candidate's readiness for practice. Licensing examinations must be developed and administered in a valid, reliable, and legally defensible manner. The purpose of this report is to provide test users with an overview of descriptive and technical documentation regarding the nature and quality of the WREB Interim Clinical Dental Examination to support inferences based on examination results.

WREB examinations are developed, administered, and scored in accordance with the *Standards for Educational and Psychological Testing* (AERA, APA, NCME; 2014) and *Guidance for Clinical Licensure Examinations in Dentistry* (AADB, 2005). An overview and description of activities conducted to evaluate the technical quality of the WREB Interim Clinical Dental Examination, with a focus on the new Operative Simulation Section, are provided, including psychometric and statistical results of field-testing. Details of additional activities and research studies relevant to the Interim Clinical Dental Examination are also maintained and available for review by test users, test takers, and other stakeholders.

Background and Overview of the Interim Examination

WREB has been researching and evaluating the validity and viability of alternatives to patient-based assessment for several years. For example, simulations that could substitute for Operative Dentistry and Periodontics, the two patient-based sections of WREB's standard dental examination, are currently in development and undergoing review. WREB had not planned to implement any of these assessment alternatives during the 2020 dental examination season.

The advent of health risks due to the COVID-19 (SARS-CoV-2) virus and the social-distancing directives that have been in place since March of 2020 has put pressure on many state licensing boards to consider temporary alternatives to the traditional patient-based dental

examination. Several state licensing boards have requested that WREB propose temporary examination alternatives that could be administered during the COVID-19 crisis.

WREB has developed an interim alternative examination that includes existing simulation sections (i.e., Comprehensive Treatment Planning [CTP], Endodontics, and Prosthodontics) and a new, field-tested, restorative dentistry simulation that can serve as a temporary replacement for the patient-based Operative Section while the challenges posed by COVID-19 limit patient-based options. A brief overview of temporary changes to existing examination sections will be provided, followed by a more detailed description of the development and collection of validity evidence for the new Operative Simulation Section.

Existing Examination Sections

Comprehensive Treatment Planning (CTP) Section. WREB's existing Comprehensive Treatment Planning (CTP) Section is a performance-based ASCE (Authentic Simulated Clinical Examination) which requires the candidate to construct responses (as opposed to an OSCE in which the candidate selects responses from options, locations, or choices provided). The CTP Section is open-ended and graded by independent, anonymous examiners. It reveals candidate thinking and requires candidates to perform tasks that dentists perform and to make decisions that dentists make, all without choices they can select or cues of any kind. The construction of appropriately sequenced treatment plans and item responses requires broad understanding of diagnostic, preventive, restorative, endodontic, periodontal, prosthodontic, oral surgical, radiological, pediatric dentistry, and patient-management procedures, as well as the relationships between these procedures and their clinical application under various patient conditions. The CTP examination can result in failure if a candidate commits a critical error, i.e., constructs a response that could result in life-threatening harm, such as administering more than the upper limit of a safe dose of local anesthetic for the weight of a pediatric patient. The CTP Section has been administered to dental licensure candidates since 2014 and will be a required, unchanged section on the WREB Interim Clinical Dental Examination. Details and results of technical analyses and candidate results for the CTP Section have been documented in annual technical reports (e.g., WREB, 2019a).

Over 2,000 dental candidates have already completed the CTP examination for the 2020 season, including 1,035 from dental schools in Nevada and its neighboring states (i.e., California,

Oregon, Utah, and Arizona). For any candidates who have not yet challenged the CTP Section, Prometric testing centers are opening for testing in May 2020 and have established guidelines for social distancing and safety (https://www.prometric.com/corona-virus-update).

Endodontics Simulation Section. WREB's existing Endodontics Section is a performance-based clinical simulation examination. The candidate is required to perform two endodontic procedures on simulated teeth mounted in a segmented arch which is mounted in a manikin that is positioned to simulate working on a patient. Candidates must maintain the simulated patient position and adhere to Standard (Universal) Precautions throughout the examination. The anterior tooth procedure requires treatment of a maxillary central incisor simulated tooth, including access, instrumentation and obturation. The posterior tooth procedure requires access of a mandibular first molar simulated tooth. Access of the posterior tooth must enable grading examiners to identify all canal orifices. Like all WREB Dental Examination sections, the Endodontics Section is graded by independent, anonymous examiners. The Endodontics Section has been administered since 1985 and will be a required section on the WREB Interim Clinical Dental Examination. Details and results of technical analyses and candidate results for the Endodontics Section have been documented in annual technical reports (e.g., WREB, 2019a).

The only changes to the Endodontics Section are specific COVID-19-related social distancing and infection prevention protocols that must be followed to ensure the safety of all individuals involved in the examination and examination-related activities. Besides adhering to the simulation protocol for patient position and Standard (Universal) Precautions, candidates also are required to follow any additional social-distancing and infection-prevention protocols imposed by the exam site.

Prosthodontics Simulation Section. WREB's existing Prosthodontics Section is a performance-based clinical simulation examination. The candidate is required to perform two prosthodontic procedures (three preparations) on simulated teeth in a mounted articulator and manikin that is positioned to simulate working on a patient. Candidates must maintain the simulated patient position and adhere to Standard (Universal) Precautions throughout the examination. Candidates are required to prepare an anterior tooth for a full-coverage crown and prepare two abutments to support a posterior three-unit fixed partial denture prosthesis (i.e., bridge). The three-unit bridge

must have a path of insertion that allows full seating of the restoration. Like all WREB Dental Examination sections, the Prosthodontics Section is graded by independent, anonymous examiners. The current version of the clinical Prosthodontics Section has been administered since 2018 and is required by most states accepting the WREB Interim Clinical Dental Examination. Details, technical analyses, and candidate results are documented in annual technical reports (e.g., WREB, 2019a).

As with the Endodontics Section, the only changes to the Prosthodontics Section specific COVID-19-related social-distancing and infection-prevention protocols that must be followed to ensure the safety of all individuals involved in the examination and examination-related activities. Besides adhering to the simulation protocol and Standard (Universal) Precautions, candidates also are required to follow any additional social-distancing and infection-prevention protocols imposed by the exam site.

Periodontics Patient-Based Section. WREB subject matter experts (SMEs) on the Operative and Periodontics Examinations Committee have recommended that due to COVID-19 the patient-based Periodontics Section of the Clinical Dental Examination be waived for 2020 since WREB is unable to demonstrate that a valid replacement is viable. The following evidence supports the decision to recommend temporary waiver or postponement of the Periodontics Section: a) critical aspects of periodontal diagnosis and treatment decision-making are covered throughout the CTP examination, b) the patient-based Periodontics section is the least discriminating section of the Dental Examination due to the very high rate of examination success, and c) recent practice analyses conducted jointly by WREB and CRDTS (WREB, 2019b; WREB, 2020) found that while the practices assessed on WREB's Dental patient-based Periodontics Section and Dental Hygiene Examination continue to be rated as frequently performed and important, these practices are most frequently performed by dental hygienists and rarely or never performed by dentists. Still, the ability of dental candidates to demonstrate competence on a valid, clinical examination of Periodontics continues to be valued by many states, and the patient-based Periodontics Section of WREB's standard patient-based Dental Examination will be available again when it can be administered safely.

Operative Simulation Section: Development and Field Testing

WREB has field-tested an alternative, performance-based restorative dentistry simulation (i.e., Operative Simulation Section) that could be required temporarily in lieu of the traditional patient-based Operative Section. The validation process for the simulated examination included the field-testing of social distancing for both candidates and examiners. The pre-planning and guidelines practiced with the social-distancing and infection-prevention protocols employed in the Operative Simulation Section field tests are described later and will be applied to other simulation sections (i.e., Endodontics and Prosthodontics) of the WREB Interim Clinical Dental Examination.

In the Operative Simulation Section, each candidate is required to successfully perform both preparation and finish of a conventional Class II restoration on a molar and a Class III restoration on a central incisor. All procedures are performed, like they are for the Endodontics and Prosthodontics sections, on simulated teeth, mounted in arches on a manikin with proper operational posture, appropriate employment of Standard (Universal) Precautions including Personal Protective Equipment (PPE), and with rubber-dam isolation. Results are assessed using established Operative Section scoring criteria. Certain critical errors are preserved, and the passing cut-point remains unchanged. The simulation involves social distancing for both candidates and examiners and uses materials (simulation teeth and arches) which are readily available and with which candidates and their programs are already familiar.

WREB maintains the position that any clinical restorative simulation testing, at this time, remains limited with respect to fidelity, which is a critical type of validity evidence. Even with a simulated tooth that attempts to replicate the hardness, texture, disease process, and internal anatomy of human teeth, the simulation does not fully replace the spontaneous judgments, patient management skill, and cognitive-motor coordination involved in treating a live human patient who exhibits an authentic response to local anesthesia, unpredictable movements, and has the ability to feel pain and discomfort. The alternative Operative Simulation Section that WREB is offering for 2020 is intended to be a provisional solution for COVID-19 only and is intended neither to replace WREB's patient-based Operative Section in 2020 for states that continue to require it nor to be the simulation WREB may offer in the future when the validity of a more realistic and involved simulation can be demonstrated.

The following sections will describe several aspects of the Operative Simulation Section, including a) administration procedures reflecting the additional precautions required to minimize

exposure to the COVID-19 virus, b) restorative content assessed, c) grading and scoring, d) examiner preparation and evaluation, and e) the results of field-testing conducted in early 2020.

Interim Social Distancing and Infection Prevention Protocol

Preventing infection by COVID-19 that may arise from airborne transmission or contact with potentially virulent surfaces is critical to ensuring the safety of candidates, dental school personnel, examiners and agency personnel during examination and examination-related activities. Field-testing for the Operative Simulation Section included broad attention to ensuring that a) individuals participating in the examination were sufficiently distant from each other at all times, b) individuals used appropriate PPE, and c) materials and areas remained clean and disinfected. Social-distancing and infection-prevention protocols were field tested for the Operative Simulation Section and will be implemented for all clinical sections of the WREB Interim Clinical Dental Examination. These protocols include but are not limited to the following examination features:

- Limits on numbers of personnel and candidates assigned to the examination at one time and in one location
- Distribution, required completion, and collection/review of a self-assessment survey instrument immediately prior to the examination (e.g., regarding symptoms, recent contact with suspected or known patient with COVID-19, and recent travel)
- Required capture and logging of each participant's temperature
- Assignment of separated arrival times
- Set-up, preparation, and monitoring for entry to the facility and examination area (e.g., survey completion and approval, donning face mask and eye protection, temperature capture, hand sanitization, etc.)
- Installation of floor and location markings throughout examination areas to ensure adherence to social distancing
- Location of assigned simulation stations that conform to social distancing guidelines
- Pre-provision of supplies and examination materials at simulation stations to reduce unnecessary movement

- Specific instructions regarding how to move around laboratory when necessary, how to turn in materials, and how to leave space and building upon completion without congregating
- Monitoring of social distancing, use of PPE, and contact with objects and surfaces throughout the simulation
- Appropriate cleaning and disinfection of all simulation stations and involved surfaces immediately before and following every simulation session

The features described reflect protocols that were in place for the March 30 – April 2 field-tests. These examination protocols may be augmented according to updates for infection prevention from the Center for Disease Control (CDC) or more stringent school-specific requirements. In any case the protocols employed will reflect or exceed CDC guidelines. If the test site has stricter guidelines than the CDC, then the protocol employed will reflect the test site requirements. For example, the CDC guidelines for social distancing stipulated maintaining a minimum distance of at least six feet from other individuals; one of the field-test sites required a minimum distance of ten feet, which was implemented throughout the field test.

WREB will coordinate with each site hosting an examination to develop a document communicating the social-distancing and infection-prevention protocol for that examination site. Prior to the exam this document will be provided to candidates, on-site examiners, and any other individuals who will be involved in examination. Candidates will be expected to conform to the social distancing and infection prevention protocol and may risk dismissal and failure of the examination for gross, willful, or repeated protocol violation.

Scoring sessions where grading examiners evaluate candidate performance on the submitted arches also will be subject to social-distancing and infection-prevention protocols. Similar safety features, including self-assessment and screening, number of grading examiners per room and building, social distancing, surface and material disinfection, and specific instruction regarding safe entry, movement, task performance, and exit of the facility will be provided.

Administration and Security

Time allocated for the simulation is three and one-half (3.5) hours. Candidates are allowed an additional 30 minutes to set up before the session begins.

At the exam site, candidates must provide two valid, non-expired forms of personal identification. Admittance to the exam does not imply that the identification presented was valid. If it is determined that a candidate's identification is fraudulent or otherwise invalid, WREB will report to the appropriate governing agencies or board. Any candidate or other individual who has misreported information or altered documentation in order to fraudulently attempt an examination, will be subject to dismissal and reporting.

Candidates report to the assigned simulation area at the appointed time and must bring with them their personal handpieces, burs, and anything else needed to complete preparations or restorations on the simulated teeth, including the ModuPRO® One opposing arch or equivalent needed to complete the simulation.

Candidates may bring the Operative Simulation Candidate Guide and Dental Exam Candidate Guide into the simulation lab for reference. Notes, textbooks, or other informational material must not be brought into the simulation lab. No magnification other than loupes is allowed. All electronic devices, including cell phones and smart watches, are prohibited in the simulation lab. Unique markings are applied to each arch to prevent manipulation and reinforce examination security.

Assistants are not permitted for the Operative Simulation Section. Candidates may not assist each other. This includes critiquing another candidate's work or discussion of treatment. All candidates are expected to pass the examination on their own merit without assistance.

WREB provides the maxillary arches containing the teeth needed for preparation and restoration. The candidate provides everything needed that is not provided by the test site (school), including a suitable opposing arch. Following preparation, the arch containing the prepared teeth is submitted for grading and a second arch is provided with teeth already prepared for restoration. When placement of the finish restorations is completed, the second arch is submitted for finish grading.

Candidates are to work independently, observe Standard (Universal) Precautions, and work in a manner that simulates performing procedures on a patient throughout the simulation. Any unprofessional, unethical, or inappropriate behavior could result in immediate dismissal and failure of the Operative Simulation. If, after receiving notice of a violation, a candidate repeatedly violates simulation protocol, Standard (Universal) Precautions, or the social distancing and infection

prevention protocol for the exam site, they will be dismissed from the simulation and will fail the Operative Simulation Section.

Additional details of administration procedures and security guidelines are included in the Operative Simulation Candidate Guide, Dental Exam Candidate Guide, Operative Simulation Examiner Manual, and Dental Exam Examiner Manual.

Operative Simulation Test Specifications and Grading Criteria

The Operative Simulation Section consists of one extended examination session during which two (2) operative (restorative) procedures are performed on simulated teeth. The procedures are:

1. Preparation and restoration of a conventional Class II (MO) in tooth 14.
    - The candidate may choose the restorative material (amalgam or composite).
    - The preparation can but need not cross the tooth's oblique ridge.
2. Preparation and restoration of a Class III (ML) in tooth 9 with composite.

The procedures are performed on simulated teeth mounted in a manikin positioned to simulate working on a patient. The simulated tooth has the same anatomy and polymers as the teeth that are required for the Prosthodontics Simulation Section. Vendor supply is available for both testing and candidate practice despite current factory closures. The teeth have no artificial decay that could introduce testing variables not encountered in candidates' current curriculum and training. Additional field testing and candidate clinical experience will be necessary for reliable implementation with artificial decay.

No modification requests are needed, which supports social distancing and infection prevention measures by reducing the handling of materials and number of examiners required to be onsite. Candidates are asked to prepare the teeth as they ideally would for minimal caries requiring restoration and so that their preparations satisfy WREB criteria for a score of "5" and then stop. The Class II preparation design must be conventional and include a pulpal floor. Both preparation and restoration (placement of the restorative material) must be accomplished with a rubber dam. When treatment is completed the arch containing the prepared or restored teeth is submitted for grading. Occlusion is not functionally evaluated.

Current dental terminology (CDT) codes that reflect the range of procedures that may be attempted are listed in Table 1.

Table 1. *Simulated Operative Section Procedure Options with CDT Codes*

Operative Section Restorative Procedure	**CDT Code(s)**
Direct posterior Class II amalgam restoration (MO, DO or MOD)	D2150, D2160
Direct posterior Class II composite restoration (MO, DO or MOD)	D2392, D2393
Direct anterior Class III composite restoration (ML, DL, MF, DF)	D2331, D2332

WREB examines candidates with varying educational backgrounds and schools may teach different preparation and restoration techniques. WREB does not look for one specific technique and scores performance according to the Operative Simulation scoring criteria described later in this section.

The scoring criteria are based on the scoring criteria employed for the conventional patient-based Operative examination section, with minor revisions, reviewed and approved by the SMEs on the Operative examination committee. The preparation criteria are Outline and Extension, Internal Form, and Operative Environment. The finish criteria are Anatomical Form, Margins, and Finish, Function and Damage. Each grading criterion is defined at five levels of performance for each procedure, with a grade of "3" representing minimal competence. A grade of "5" is defined generally to represent optimal performance, with grades of 4, 3, 2, and 1 corresponding to appropriate, acceptable, inadequate, and unacceptable performance, respectively. The performance level definitions for each type of preparation (i.e., Class II amalgam, Class II composite, and Class III composite) and for the restoration finish are published in the candidate guide and provided in Figures 1 through 4.

OPERATIVE SIMULATION CLASS II – COMPOSITE PREPARATION
SCORING CRITERIA RATING SCALE

	5–Optimal	4–Appropriate	3–Acceptable	2–Inadequate	1–Unacceptable
OUTLINE & EXTENSION	Outline is generally smooth and flowing and does not weaken tooth in any manner.	Outline is slightly irregular but does not weaken tooth. Isthmus is slightly wider than required.	Outline moderately weakens marginal ridge or a cusp. Isthmus is too wide or too narrow.	Outline severely weakens marginal ridge or a cusp. Outline is misshapen and/or forces improper angle of exit.	Outline is grossly improper and/or lacks any definite form. Unapproved surface prepared.
	Proximal and gingival extensions are visually open less than 1.0 mm	Proximal and/or gingival extensions are slightly overextended.	Proximal and/or gingival extensions are moderately overextended.	Proximal and/or gingival extensions are in contact or obviously overextended.	Proximal and/or gingival extensions are grossly overextended.
	Optimal treatment of fissures.	Near optimal treatment of fissures.	Adequate treatment of fissures. Neither the tooth nor restoration is compromised.	Inadequate treatment of fissures will compromise the tooth or restoration.	Lack of treatment of fissures will seriously compromise the tooth and restoration.
	Proximal cavosurface angles are equal to or slightly greater than 90°. The integrity of both tooth and restoration is maintained.	Cavosurface angles are not optimal, but do not compromise the integrity of the tooth or restoration. Cavosurface has small areas of minor roughness.	Cavosurface angles possibly compromise the integrity of the tooth or restoration. Cavosurface is moderately rough but will not adversely affect the final restoration.	Improper cavosurface angles or rough cavosurface will cause the final restoration to fail.	Cavosurface angles are grossly improper. Cavosurface has multiple major areas of roughness and/or enamel weakness that will cause the restoration to fail.
INTERNAL FORM	Pulpal floor depth as determined by the lesion or defect does not exceed 2.0 mm from the cavosurface. Axial wall depth at the gingival floor is 1.0 mm-1.5 mm.	Pulpal floor and/or axial wall is slightly shallow or deep.	Pulpal floor and/or axial wall is moderately shallow or deep.	Pulpal floor and/or axial wall is critically shallow or critically deep.	Walls and/or floors are grossly deep. Gross removal of tooth structure jeopardizes the tooth or pulp. Unapproved surface prepared.
	Conventional design: Internal form is smooth and flowing and has no sharp angles that could weaken or cause voids in the final restoration.	Conventional design: Internal form is mostly smooth and flowing, but some minor roughness and/or sharp angles are present.	Conventional design: Internal form is generally smooth and flowing, but some moderate roughness and/or sharp angles are present.	Conventional design: Internal form is rough and unfinished with major areas of roughness or sharp angles that will lead to restoration failure.	Conventional design: Internal form is grossly rough and/or has gross sharp angles that will lead to restoration failure.
OPERATIVE ENVIRONMENT	No damage to the adjacent tooth.	Minor damage to the adjacent tooth can be removed by polishing without changing the shape of the contact.	Damage to the adjacent tooth can be removed by polishing, but the shape of the contact will be changed.	Damage to the adjacent tooth will be difficult to polish out and still maintain appropriate proximal contour. The adjacent tooth will likely require restoration.	Damage to the adjacent tooth will require restoration.

Figure 1. Scoring criteria definitions for the Simulation Class II Composite Preparation, 2020.

OPERATIVE SIMULATION CLASS II – AMALGAM PREPARATION
SCORING CRITERIA RATING SCALE

	5–Optimal	4–Appropriate	3–Acceptable	2–Inadequate	1–Unacceptable
OUTLINE & EXTENSION	Outline is generally smooth and flowing and does not weaken tooth in any manner.	Outline is slightly irregular but does not weaken tooth. Isthmus is slightly wider than required.	Outline moderately weakens marginal ridge or a cusp. Isthmus is too wide or too narrow.	Outline severely weakens marginal ridge or a cusp. Outline is misshapen and/or forces improper angle of exit.	Outline is grossly improper and/or lacks any definite form. Unapproved surface prepared.
	Proximal and gingival extensions are visually open less than 1.0 mm	Proximal and/or gingival extensions are slightly overextended.	Proximal and/or gingival extensions are moderately overextended.	Proximal and/or gingival extensions are in contact or obviously overextended.	Proximal and/or gingival extensions are grossly overextended.
	Optimal treatment of fissures.	Near optimal treatment of fissures.	Adequate treatment of fissures. Neither the tooth nor restoration is compromised.	Inadequate treatment of fissures will compromise the tooth or restoration.	Lack of treatment of fissures will seriously compromise the tooth and restoration.
	Proximal cavosurface angles are approximately 90°. The integrity of both tooth and restoration is maintained.	Cavosurface angles are not optimal, but do not compromise the integrity of the tooth or restoration. Cavosurface has small areas of minor roughness.	Cavosurface angles possibly compromise the integrity of the tooth or restoration. Cavosurface is moderately rough but will not adversely affect the final restoration.	Improper cavosurface angles or rough cavosurface will cause the final restoration to fail.	Cavosurface angles are grossly improper. Cavosurface has multiple major areas of roughness and/or enamel weakness that will cause the restoration to fail.
INTERNAL FORM	Proximal walls are clearly convergent occlusally.	Proximal walls are barely convergent occlusally.	Proximal walls are parallel or divergent in one area.	Proximal walls are critically divergent occlusally.	Proximal walls are grossly divergent occlusally.
	Pulpal floor is 1.5 mm-2.0 mm from the cavosurface and provides adequate bulk for strength of restorative material. Axial wall depth at the gingival floor is 1.0 mm-1.5 mm.	Axial wall and/or pulpal floor is slightly shallow or deep, but still provides adequate bulk for strength of restorative material.	Axial wall and/or pulpal floor is moderately shallow or deep, but still provides adequate bulk for strength of restorative material.	Axial wall and/or pulpal floor is critically shallow or deep and does not provide adequate bulk for strength of restorative material.	Walls and/or floors are grossly deep. Gross removal of tooth structure jeopardizes the tooth or pulp. Unapproved surface prepared.
	Conventional design: Internal form is smooth and has no sharp angles. Retentive grooves, if placed, are near ideal. Axial wall follows external contour of the tooth.	Conventional design: Internal form is mostly smooth, but some minor roughness and/or sharp angles are present. Retentive grooves, if placed, are adequate. Axial wall contour is near optimal.	Conventional design: Internal form is generally smooth, but some moderate roughness and/or sharp angles are present. Retentive grooves, if placed, are too deep or too shallow, or placed in an incorrect location. Axial wall contour is not optimal.	Conventional design: Internal form is rough and unfinished with major areas of roughness or sharp angles that will lead to restoration failure. Retentive grooves, if placed, are too deep or too shallow, or placed in an incorrect location, and will compromise the tooth or restoration.	Conventional design: Internal form is grossly rough and/or has gross sharp angles that will lead to restoration failure. Gross disregard for proper placement of retentive features will compromise the tooth and restoration.
OPERATIVE ENVIRONMENT	No damage to the adjacent tooth.	Minor damage to the adjacent tooth can be removed by polishing without changing the shape of the contact.	Damage to the adjacent tooth can be removed by polishing, but the shape of the contact will be changed.	Damage to the adjacent tooth will be difficult to polish out and still maintain appropriate proximal contour. The adjacent tooth will likely require restoration.	Damage to the adjacent tooth will require restoration.

Figure 2. Scoring criteria definitions for the Simulation Class II Amalgam Preparation, 2020.

OPERATIVE SIMULATION CLASS III – COMPOSITE PREPARATION
SCORING CRITERIA RATING SCALE

	5–Optimal	4–Appropriate	3–Acceptable	2–Inadequate	1–Unacceptable
OUTLINE & EXTENSION	Outline provides optimal convenience form (access for caries removal and insertion of restorative material). Gingival extension is visually open up to 0.5 mm. Facial (or lingual) extension may break proximal contact up to 0.5 mm. Incisal contact is not broken. Includes proximal contact area.	Outline is slightly over or under extended. Outline is slightly irregular but does not weaken the tooth. Includes proximal contact area with slight variation.	Outline is moderately over or under extended. Outline is moderately irregular but does not weaken the tooth. Gingival margin is moderately overextended. Includes proximal contact area with moderate variation.	Outline is severely over or underextended. Gingival wall is in contact or obviously overextended. Incisal extension has broken contact. Mostly below proximal contact area where caries would be expected.	Outline is grossly improper and/or lacks any definite form. Gingival wall is grossly overextended. Unapproved surface prepared. Wholly below proximal contact area where caries would be expected.
	Cavosurface forms a smooth continuous curve with no sharp angles.	Cavosurface is slightly irregular and rough; no sharp angles.	Cavosurface is moderately irregular and rough. A few sharp angles are present.	Cavosurface is severely irregular and/or with sharp angles.	Cavosurface has multiple gross irregularities that will cause the restoration to fail.
	There are no acute cavosurface angles.	Cavosurface angles are not optimal, but do not compromise the integrity of the tooth or restoration.	Cavosurface angles possibly compromise the integrity of the tooth or restoration.	Cavosurface angles will lead to enamel fracture or fracture of the restoration.	Cavosurface angles are grossly inappropriate for the situation and will lead to fracture of the restoration.
INTERNAL FORM	Axial wall follows external contour of tooth. Depth does not exceed 1.0 mm beyond the DEJ.	Axial wall generally follows external contour of tooth. Depth does not exceed 1.5 mm beyond the DEJ.	Axial wall does not follow contour of tooth. Depth does not exceed 2.0 mm beyond the DEJ.	Axial wall depth exceeds 2.0 mm beyond the DEJ.	Gross removal of tooth structure jeopardizes the tooth or pulp. Unapproved surface prepared.
	Internal line angles are rounded and smooth. Internal walls are well defined.	Internal walls are well defined and rounded but have some slight irregularities.	Internal walls are rounded, but moderately rough, irregular, and not defined. Moderately sharp line angles are present.	Internal walls are severely irregular and not defined. Angle of walls undermines enamel, jeopardizes incisal angle, or encroaches on the pulp.	Grossly irregular and sharp line angles show total disregard for the health of the tooth.
OPERATIVE ENVIRONMENT	No damage to the adjacent tooth.	Minor damage to the adjacent tooth can be removed by polishing without changing the shape of the contact.	Damage to the adjacent tooth can be removed by polishing, but the shape of the contact will be changed.	Damage to the adjacent tooth will be difficult to polish out and still maintain appropriate proximal contour. The adjacent tooth will likely require restoration.	Damage to the adjacent tooth will require restoration.

Figure 3. Scoring criteria definitions for the Simulation Class III (Composite) Preparation, 2020.

OPERATIVE SIMULATION FINISH RESTORATION
SCORING CRITERIA RATING SCALE

	5–Optimal	4–Appropriate	3–Acceptable	2–Inadequate	1–Unacceptable
ANATOMICAL FORM	Anatomical form is consistent and harmonious with contiguous tooth structure.	Slight variation in normal anatomical form is present.	Moderate variation in normal anatomical form is present. Marginal ridge is improperly shaped.	Anatomical form is improper. Marginal ridge is poorly shaped. Anatomy is too deep or too flat.	There is gross lack of anatomical form.
	Proper proximal contour and shape are restored.	There is slight variation of proximal contour and shape.	There is moderate variation of proximal contour and shape.	Proximal contour is poor. Embrasures are severely over or under contoured.	Grossly improper proximal contour or shape.
	Normal proximal contact area and position are restored. Contact is visually closed and resists the passage of lightly waxed floss.	There is slight variation of normal contact area and position. Contact is visually closed and resists the passage of lightly waxed floss.	There is moderate variation of normal contact area and position. Lightly waxed floss will pass through the contact with slight resistance.	Contact is visually open; contour is pointed and sharp; or so broad, flat or tight that floss will not pass easily pass through the contact.	Contact is grossly open; contour terminates far from the adjacent tooth or the restoration is bonded to the adjacent tooth.
MARGINS	There are no excesses or deficiencies anywhere along margins.	Slight marginal excesses and/or deficiencies are present.	Moderate marginal excesses and/or deficiencies are present.	A deep open margin is present, or critical excesses or deficiencies are present. A marginal overhang catches floss.	Multiple open margins, or gross excesses, or deficiencies, are present. A gross marginal overhang shreds floss.
FINISH, FUNCTION & DAMAGE	The surface is smooth with no pits, voids or irregularities.	Slight surface irregularities, pitting, or voids are present.	Moderate surface irregularities, pitting, or voids are present.	Critical surface irregularities, pitting, or voids are present.	Gross surface defects are present and/or the restoration is grossly fractured.
	There is no damage to hard or soft tissue.	Minor damage to hard or soft tissue is evident.	Moderate damage to hard or soft tissue is evident.	Severe damage to hard or soft tissue is evident. Open contact risks trapping food debris or overly tight contact makes flossing difficult.	Gross mutilation of hard or soft tissue is evident. Grossly open contact exposes interdental col to potential trauma or fused teeth make flossing impossible.

Figure 4. Scoring criteria definitions for the Simulation Class II and Class III Finishes, 2020.

Scoring and Results Reporting

Performance for each preparation and finish, is graded by three independent and anonymous examiners who are calibrated to the scoring criteria prior to every examination. Each preparation or finish is scored on the applicable criteria according to rating scales presented above. Examiners are trained to assign a particular grade on the scale only when *all* aspects of performance described for that level have been demonstrated. For example, if performance on the criterion under review meets most aspects of the definition for a grade of "3" but does not quite meet the standard for even one aspect of the definition, then the grade assigned will be a "2," at most. This holds for all six criteria per restoration.

The median of the three examiner grades is computed for each criterion and is weighted to reflect the level of criticality relevant to minimally competent treatment, e.g., Outline and Extension accounts for 46% of the preparation score and Operative Environment accounts for only 15%. The criterion weights are provided in Tables 2a and 2b.

Tables 2a and 2b. *Operative Simulation Scoring Criteria and Weighting: Preparation, Finish*

Preparation Criteria and Weighting	
Outline & Extension	46%
Internal Form	39%
Operative Environment	15%

Finish Criteria and Weighting	
Anatomical Form	36.5%
Margins	36.5%
Finish, Function & Damage	27%

The mean of the preparation and finish scores is the restoration procedure score. The mean of the two procedure scores, after any applicable penalties or deductions, is the final Operative Simulation Section score.

The passing cut score on the Operative Simulation Section is 3.00, which reflects minimally competent performance within the five-point rating scale for all criterion grades that contribute to the final section score. Each performance level definition for a score of 3.00 on a criterion has been worded to describe performance that would be deemed minimally competent via consensus of the subject matter experts on the Operative section examination committee. While methods of standard setting applied to selected-response assessment often rely on SMEs evaluating each test question based on how each SME believes a minimally competent examinee would

perform, standard setting for many performance-based assessments involves defining minimum expectations that can be observed directly in the candidate's performance. The performance level definitions (Figures 1 through 4), as developed by the examination committee, are critical to guiding examiner grading. The definitions are used to describe examples of clinical performance reviewed during examiner training and calibration, which provides performance benchmarks to facilitate examiner adherence to the criteria and a high degree of examiner agreement.

While limitations on travel and group activity size due to COVID-19 remain in effect, the grading of candidate performance will take place in grading sessions after the examination. While this reduces the number of examiners traveling to and grading at the examination site, it also prevents candidates from receiving onsite results immediately. Candidates and state licensing boards will receive results as soon as possible after grading sessions are held. Results reports will indicate clearly whether the Operative Examination was a simulation or involved the treatment of a patient. As with all WREB examinations, results of all examination attempts, regardless of pass or fail outcome, will be available to state licensing boards.

Examiner Training and Calibration

Most examiners are members or designees of their state boards. A small proportion (e.g., approximately twenty percent of examiners in 2019) are dental educators. All examiners must be actively licensed and in good standing, with no license restrictions, and submit proof of license renewal annually. Under social distancing restrictions, the only examiners that may be present at the Operative Simulation Section may be the Chief Examiner and one or more Floor Examiners, depending on the layout and size of the examination environment. There will not be any grading examiners at the examination site unless social distancing and travel guidelines have been eased enough to allow this. Under the current restrictions, grading examiners will grade candidate performance in grading sessions, separate from the examination environment. Grading examiners still will need to complete examiner self-assessments and calibration testing prior to grading.

Clinical examination scores are dependent upon the judgments of grading examiners. A high degree of examiner agreement is critical to assessing candidate ability in a reliable and fair manner. As with the conventional Operative Examination, scoring judgments on the Operative Simulation Section are made by three independent examiners. The median of the three grades

assigned contributes to the candidate's score. The median is more robust to extreme grades assigned than the mean (i.e., conventional average).

Having multiple examiners helps to moderate the effects of varying levels of examiner severity; however, it is essential that all examiners are trained and calibrated to an acceptable level of agreement with respect to the scoring criteria for the examinations in which they participate. Examiners must participate in orientation and calibration sessions that take place before every examination or grading session. During calibration, examiners take assessments (tests) in which they grade examples of clinical performance according to the grading criteria. Their judgments are compared to scores that have been previously selected by the examination committees as representative of the defined levels in the criteria. The examiner team completes calibration tests until they each have demonstrated that they understand and can consistently apply WREB criteria in their assessments. All calibration tests are reviewed regularly for content and psychometric quality by WREB examination committees.

Examiners receive feedback on their performance after each examination. Examiners with low percentages of agreement, high percentages of harshness or lenience, or erratic grading patterns are counseled, remediated, and monitored to ensure increased understanding of criteria definitions. Continued lack of agreement results in dismissal from the examination pool.

The two main approaches employed to evaluate examiner performance include a review of examiner agreement which reflects the degree of exact and adjacent agreement and an estimation of examiner severity employing a probabilistic statistical model which is designed to account for and quantify potential sources of construct-irrelevant variance such as rater bias and error. With three examiners there are multiple ways to define and track examiner agreement. WREB uses a conservative computation of exact and adjacent agreement which involves comparing each examiner rating, i.e., each individual grade assigned to a particular criterion, to the mean of the other two raters' grades assigned for the same criterion, within the same examination attempt. Examiner ratings that may be adjacent to the rating of another rater may still be categorized as harsh or lenient since agreement is defined as the rating falling within one scale point of the *mean* of the other two ratings. Examiner severity is estimated using the Many-faceted Rasch Model (Linacre, 1994; Rasch, 1960/1980) and allows examiner performance to be compared to the performance of all other examiners within the examiner pool along a continuum of harshness to lenience and provides statistical information regarding rater errors such as erratic grading or

grading that shows too little discernment among performance levels (e.g., assigning all or mostly "3"s). Additional details regarding methods and results of examiner evaluation are provided in the WREB Dental Examination Technical Report (WREB, 2019a)

Field Testing of the Operative Simulation Section: Overview

Two Operative Simulation field-tests were planned and conducted between March and May of 2020. A total of 79 dental students from two dental schools participated; three students attempted the examination twice resulting total of 82 attempts. These students planned in advance to challenge the field test examination twice.

The planning of the field tests included the review and revision of the Operative scoring criteria, creating a candidate guide for field test candidates, coordinating with each school to produce social distancing and infection prevention protocols, and developing examiner training and calibration materials.

One field test was conducted on March 30, 2020 at the University of Oklahoma with 20 dental students. A second field test was held on April 1 and 2, 2020 at the University of Utah with 59 dental students. WREB has already been conducting conventional clinical dental examinations at these two schools and their campuses were reasonably accessible to WREB's dental consultants, given the limitations and recommendations regarding travel due to COVID-19. Oklahoma and Utah are the states of residence of WREB's two consulting SME dentists, who oversee examination development and administration. The field test conducted at the University of Oklahoma used a simulated tooth constructed of a harder material which generated student concerns reflected in the post-examination candidate survey comments. The second field test, conducted at University of Utah, employed the final choice of material which did not elicit these concerns.

Initial Field Test Results: Faculty-graded

The performance of the 20 field test candidates who attempted the Operative Simulation at the University of Oklahoma were initially graded by their faculty to partially fulfill program competency requirements. The 20 scores based on the University of Oklahoma faculty grading ranged from 2.94 to 4.37, with a mean score of 3.72 (SD = 0.41). Candidate scores (N = 57) from the same university taking the WREB Operative section during the 2019 season ranged from 3.13

to 4.87, with a mean score of 3.90 (*SD* = 0.40). The field test results were not as high as the examination results from 2019, but an independent samples *t*-test conducted to compare the results indicated that the difference is not significant, with a value of t ($df = 75$; $\alpha = 0.05$) = 1.67 and mean difference of 0.17 ($p = 0.10$; 95% CI: -0.03, 0.38). The comparison is based on a small sample but provides an initial indication of comparability. There was also no notable difference between mean scores of the anterior tooth (3.73, SD = 0.51) and the posterior tooth (3.71, SD = 0.44) for the faculty-graded teeth.

After the examination and the grading conducted by faculty, some of the teeth that had been treated by the candidates at the University of Oklahoma field test were modified to reflect specific descriptors in the scoring criteria. These modified teeth and examples of candidate performance were then used in developing examiner training materials. The resulting preparations and finished restorations were photographed and used as exemplars in examiner training and calibration testing. The modified teeth will be graded along with the field-test performances from the other field test examination site, but will also be analyzed separately, as they do not represent the candidates' original performance.

Treatment Times

Candidates were allowed up to four hours to complete the Operative Simulation Field Test. The time spent preparing the preparations and the finishes was recorded for each field-test attempt to determine if the initial time allotted was sufficient. The average total time used for the 82 field test attempts was 2 hours, 10 minutes (130 minutes). The least amount of time needed was 1 hour, 22 minutes and the longest amount of time needed was 3 hours, 52 minutes. All but four candidates (4.8%) completed their procedures in less than 3 hours and 30 minutes. The University of Oklahoma site used more treatment time due to additional time needed for set-up between the preparation and finish procedures. The need for this additional time was eliminated with the use of a single tooth material for the second field test. The time allotted for the examination going forward was reduced to 3 hours and 30 minutes. Table 3 shows the treatment times per field test site.

Table 3. Operative Simulation Treatment Times in Minutes by Field Test Site.

Field Test Site	*N* Attempts	Minimum Treatment Time	Maximum Treatment Time	Mean Treatment Time (*SD*)
Univ. of Oklahoma	20	106 min	232 min	174 min (37.5)
Univ. of Utah	62	82 min	190 min	116 min (20.7)
Total	82	82 min	232 min	130 min (35.6)

Field-Test Candidate Survey Results

Students who participated in one of the two Operative Simulation field tests were sent a link to an online survey. The response rate was 53% (42 out of 79 individual field-test candidates); with a slightly higher response rate for University of Oklahoma participants (65%) than University of Utah participants (49%). Survey responses assisted the development of the examination by prompting improvements to the Candidate Guide and examination schedule and by supporting the final determination of simulated tooth material.

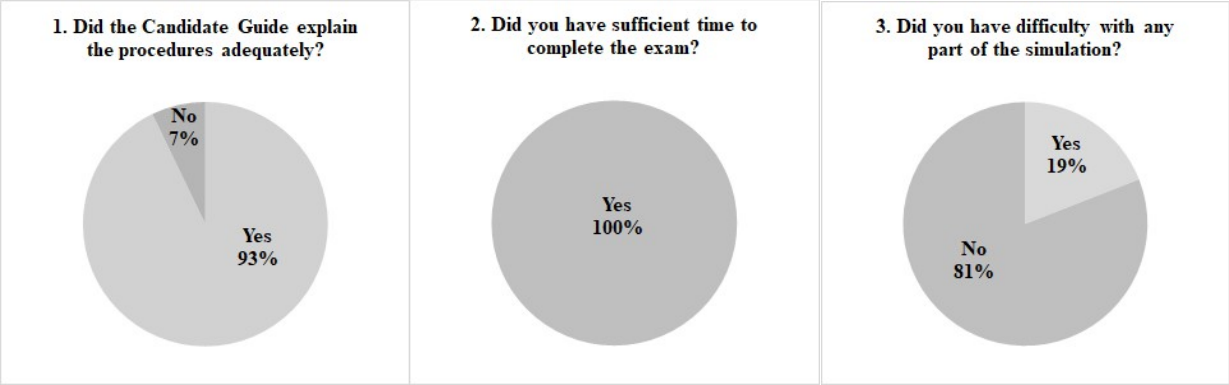
There were seven main questions and all questions offered the option to provide comments. There was a section for additional comments or suggestions at the end. Results for the seven questions are listed below, with a summary of responses and examples of comments.

The first three questions asked about the Candidate Guide, time allotted and whether the field-test candidate had any difficulty with any part of the simulation:

1. Did the Candidate Guide explain the procedures adequately?
2. Did you have sufficient time to complete the exam?
3. Did you have difficulty with any part of the simulation?

Only three of the 42 field-test candidates (93%) responded “No” to Question 1 (Figure 5a) regarding the Candidate Guide. All three noted that the guide could be more clear regarding the depth and extension of the preparation without needing to request extensions and wording to make this clear has been added to the Candidate Guide. All 42 field-test candidates responded that they

had sufficient time to complete the examination (Figure 5b). Eight of the 42 respondents (19%) expressed difficulty with part of the simulation (Figure 5c). In the optional comments, most of these concerns were about the difficulty of adjacent teeth having differing degrees of hardness; all were from field-test candidates at the University of Oklahoma, where a different tooth material was tested. The material that was employed at the second field test did not elicit these concerns and is the final choice of material planned for the Operative Simulation Section.



Figures 5a, b, c. Proportion of Yes or No responses to Field-Test Survey Questions 1, 2 and 3.

Question 4 asked about the level of challenge posed by the examination, overall.

4. Overall, was the exam easy, moderate, or difficult?"

Most respondents (37 of 42 or 88%) answered "Moderate" to Question 4 (Figure 6). Most comments offered regarding Question 4 compared the simulated teeth to natural teeth, e.g., "Going back to cutting on typodonts is always a readjustment! But definitely a valid test of hand skills. Certain aspects are more difficult and certain aspects are less difficult compared to treating human patients" and "The teeth were much softer, so probably required more dexterity than doing it on an actual person but very doable."

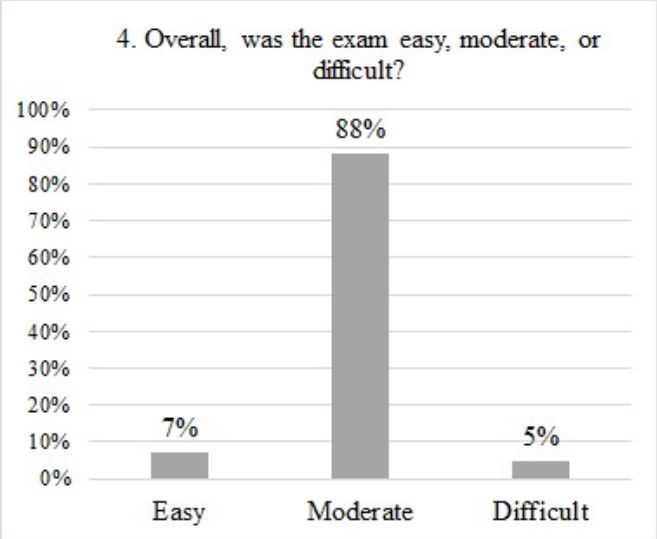


Figure 6. Proportion of different responses to Field-Test Survey Question 4.

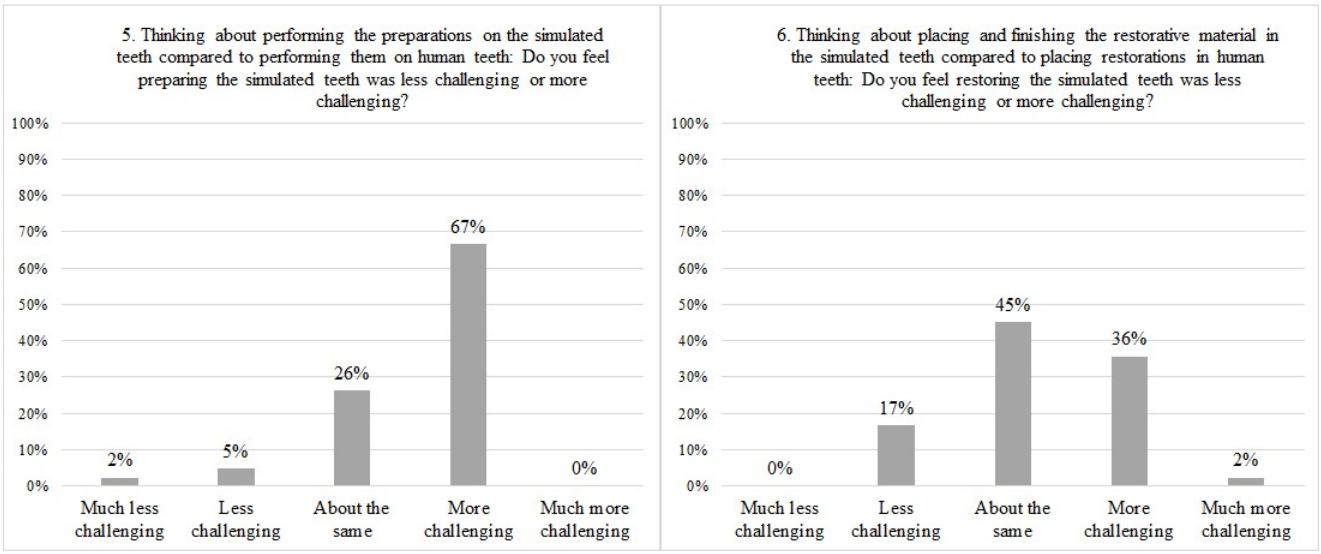
Questions 5 and 6 asked about the degree of challenge specifically regarding the preparation and the finish, respectively. Five response options were provided, ranging from Much Less Challenging to Much More Challenging.

5. Thinking about performing the preparations on the simulated teeth compared to performing them on human teeth: Do you feel preparing the simulated teeth was less challenging or more challenging?
6. Thinking about placing and finishing the restorative material in the simulated teeth compared to placing restorations in human teeth: Do you feel restoring the simulated teeth was less challenging or more challenging?

Many field-test candidates responded “About the Same” or “More Challenging” to Questions 5 and 6, with 93% (Question 5 regarding preparations) and 81% (Question 6 regarding placing and finishing) responding in one of these two categories (Figures 7a and 7b). The preparations were considered “More Challenging” by 28 of 42 (67%) and respondents’ comments were similar to those made about tooth material on Question 4, e.g., “Because simulated teeth are much softer, I feel it takes more skill, accuracy and care to complete the exam” and “You have to have a lot better hand skills on the typodont teeth due to the fact that they are softer. You have to really be good at placement and control of the burr. It also requires better restorative placement as it's easier to

accidentally remove tooth while finishing and polishing." An example comment from one of the eleven (26%) respondents who selected "About the Same" stated, "More challenging due to the lack of recent practice on teeth with this hardness, but less challenging due to known parameters and no need for modifications."

Nineteen of 42 (45%) respondents felt that the placing and finishing of the teeth was "About the Same" but only a few offered comments, e.g., "Less challenging due to no need for etching, more challenging from the difference in stability (possible loose screws, extremely tight contacts, no wedging ability)." The source of the loose screws was identified and remedied prior to the second field test. Most comments were associated with the fifteen (36%) responses of "More Challenging," and involved the tooth material, e.g., "I felt placing the material was the same but polishing and removing flash was much more difficult on typodont teeth" and "Polishing composite on real teeth is MUCH easier than polishing on typodont teeth." The few comments that accompanied the seven (17%) responses of "Less Challenging" reflected dryness and isolation, e.g., "Obviously, there isn't any saliva, so keeping a dry field is simple" and "Better isolation."



Figures 7a, b. Proportion of different responses to Field-Test Survey Questions 5 and 6.

Question 7 asked about the ability to maintain social distancing at the examination.

7. How difficult was it for you to maintain social distancing during the examination?

Most field-test candidates (39 of 42 or 93%) responded that it was "Easy" to maintain social distancing during the examination (Figure 8). All but one comment were associated with responses of "Easy." Examples include "Really strict and functional rules in place. Wasn't a problem at all" and "I was at least ten feet away from anyone else in the room at all times." The other comment, associated with a response of Moderate, stated, "During the announcement portion of the exam, prior to the beginning, it was moderately difficult to maintain social distancing and adequately hear the announcements and questions." Plans have been implemented for additional information to be provided early to candidates, allowing for questions by phone or email prior to the examination to reduce the need for multiple announcements and possible reasons to encourage crowding.

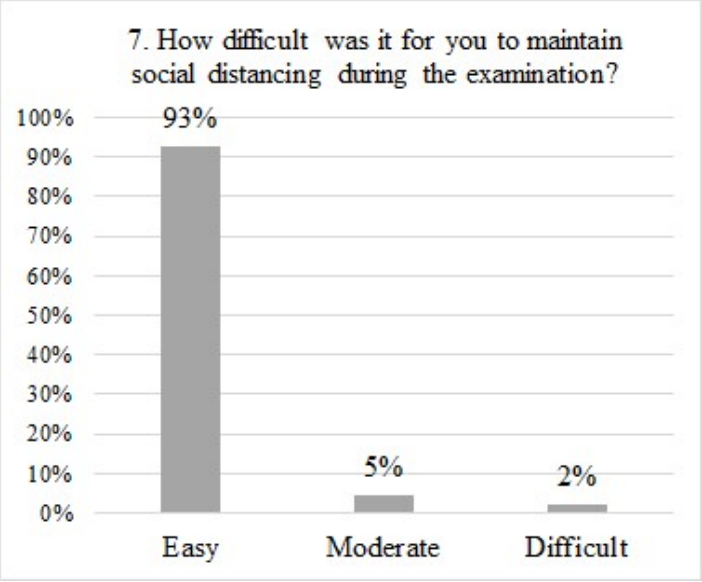


Figure 8. Proportion of different responses to Field-Test Survey Question 7.

Field-test candidates could offer additional comments or suggestions at the end of the survey. Many comments were generally positive or expressed thanks, e.g., "Overall it was great!" and several expressed their interest that this type of restorative examination be an acceptable option

going forward, e.g. “Replace patient exams with typodonts!” Some comments were concerned with the current situation related to COVID-19, e.g., “I think this is a great way to test in a safe environment given the circumstances of the class of 2020.” Most comments reinforced earlier comments regarding tooth material that, as noted above, will not apply, given the final choice of tooth material for the simulation examination. Suggestions regarding the schedule of treatment within the examination were offered by field-test candidates at the first field test; the timing in the second field-test was structured without interruption between the completion of preparations and finishes and is the final schedule planned for the examination.

Field-Test Grading Session Overview

Seven examiners participated in the April 30 – May 1 Operative Simulation field-test grading session, completing calibration exercises and tests prior to grading. Social distancing and infection prevention measures were followed, to ensure the safety of examiners and staff while using electronic scoring equipment and handling arches during grading.

On the first day, five examiners were able to complete the grading of all 82 attempts on the Operative Simulation field tests, with three sets of grades per attempt. On the second day, two additional examiners regraded the attempts, resulting in a total of four sets of grades per attempt. Candidate results and examiner performance were analyzed for the first day, which reflects conventional grading procedures, i.e., three examiners per attempt, as well as with the additional sets of grades from the second day combined, to obtain additional information, statistics and feedback regarding e.g., the effectiveness of calibration, the generalizability of grading criteria, and the performance of field-test candidates.

Field-Test Examiner Performance

Field-test examiner performance was evaluated via two approaches: examiner agreement statistics and examiner severity estimation. Examiner agreement was computed on the examiner team that completed grading on the first day. Examiner severity was conducted with and without the additional grades assigned on the second day. An overview of methods are described above on page 15 and in additional detail in technical reports, e.g., WREB Dental Examination Technical Report (WREB, 2019a).

Percentages of agreement were computed for the three sets of grades assigned on the first day of grading, as would be conducted for an actual examination after all three sets of grades per attempt have been assigned. Over the past ten years, percentages of agreement for the standard Operative Section have ranged from 88.4% to 89.9%, with comparatively balanced percentages of harshness and lenience. Examiner agreement over the years reflects examiner grading teams that have been selected for each examination based on their past examiner performance to ensure an optimal balance of examiner severity level. While nearly all examiners perform within recommended ranges of harshness and lenience percentages, to assign all the examiners that have performed at one end of that continuum to a single examination could introduce a systematic bias. The examiners who participated in the field-test grading session were scheduled based on location and convenience, given the conditions posed by COVID-19. The field-test examiners also included two relatively new examiners, who would not be assigned to the same examination under conventional conditions. Despite these potential threats to optimal examiner team performance, examiner agreement statistics for the field-test grading session were comparable to percentages of agreement, harshness, and lenience for the standard Operative section in previous years. Table 4 provides examiner agreement percentages for the standard Operative Section from the 2019 season and for the Operative Simulation field test grading session.

Table 4. *Percentages of Examiner Agreement, Harshness, and Lenience: Standard Operative Section and Operative Simulation Field Test*

	N Examiners	% Harsh	% Lenient	% Agreement
Standard Operative Section 2019 Season	110	5.5%	5.3%	89.2%
Operative Simulation Field Test Day 1	5	5.6%	5.7%	88.7%

Examiner severity estimated with the many-faceted Rasch model, is reported in Table 5, which provides summaries of results in logit, i.e., log-odds, units. High negative logits reflect more lenience and high positive logits reflect more harshness. For the standard Operative Section examination, most examiners fall within one logit unit of the mean, i.e., between -1.00 and 1.00, and within recommended ranges with respect to infit and outfit mean-square fit statistics, i.e.,

between 0.50 and 1.50. Examiner severity estimates for the first day of the Operative Simulation field test and for all Operative Simulation field-test examiners reflect smaller ranges with no outlying values. Additional details of the Many-faceted Rasch Model analyses are provided later with the results of field-test candidate performance.

Table 5. *Many-Faceted Rasch Model Examiner Severity Analysis Indicators in Logits: Standard Operative Section and Operative Simulation Field Test (Number of examiners provided below each header)*

Indicator	Standard Operative Section 2019 Season (N_E = 110)	Operative Simulation Field Test Day 1 (N_E = 5)	Operative Simulation Field Test All (N_E = 7)
Severity Measure Logit (Range)	-0.88 – 1.06	-0.41 – 0.44	-0.33 – 0.52
Standard Error (Range)	0.05 – 0.16	0.05 – 0.07	0.05 – 0.07
Severity Measure Logit Mean[a]	0.0	0.0	0.0
Severity Measure Logit *SD*	0.42	0.33	0.31
Infit Mean-Square (Range)	0.54 – 1.77	0.71 – 1.25	0.66 – 1.38
Outfit Mean-Square (Range)	0.52 – 1.72	0.72 – 1.22	0.66 – 1.32

[a] Mean of examiner severity parameters constrained at 0.

Field-Test Examiner Survey Results

The seven examiners who participated in the Operative Simulation field test grading session were sent a link to an online survey. The response rate was 100%. There were eight main questions and all questions offered the option to provide comments. There was a section for additional comments or suggestions at the end. Results for the eight questions are listed below, with a summary of responses and examples of comments.

Examiners responded unanimously to the first five questions, which asked about materials, instrumentation provided, difficulty of the grading tasks, as well as their understanding of, and ability to follow, the social distancing protocol. Possible responses to the first five questions were

Yes or No, except for Question 3, with possible responses of Easy, Moderate, or Difficult. The first five questions and the common responses are provided in Table 6.

Table 6. *Operative Simulation Grading Session Field-Test Examiner Survey Questions 1 to 5 with Responses*

Questions 1 to 5	Unanimous Response
1. Did the Candidate Guide and Examiner Manual adequately explain the simulation and grading procedures?	Yes, 100%
2. Were the social (physical) distancing instructions clear and easy to understand?	Yes, 100%
3. How difficult was it for you to maintain appropriate social (physical) distancing while serving as an examiner?	Easy, 100%
4. Did you have difficulty with any of the grading tasks?	No, 100%
5. Was the instrumentation provided for your use, everything you needed?	Yes, 100%

Optional comments associated with the first five questions were positive, e.g., regarding ability to maintain social distancing, (Question 3), "I felt very safe" and regarding grading tasks (Question 4), "Calibration was well orchestrated and provided the preparation necessary for us as examiners to perform efficiently and effectively. Nice job!"

Question 6 asked the field-test examiners about how well the calibration exercises prepared them for grading. Figure 9 illustrates the percentages of each response. Five examiners (71%) responded "Very well." One commented, "It was my first time actually grading so it was very helpful to me." Two (29%) responded "Well enough" accompanied by the following two comments, "Too detailed which sometimes can create more issues than being useful" and "This was a new exam but we made do," which suggest that continued review and refinement may be useful. The criteria has already been evaluated and edited based on examiner feedback.

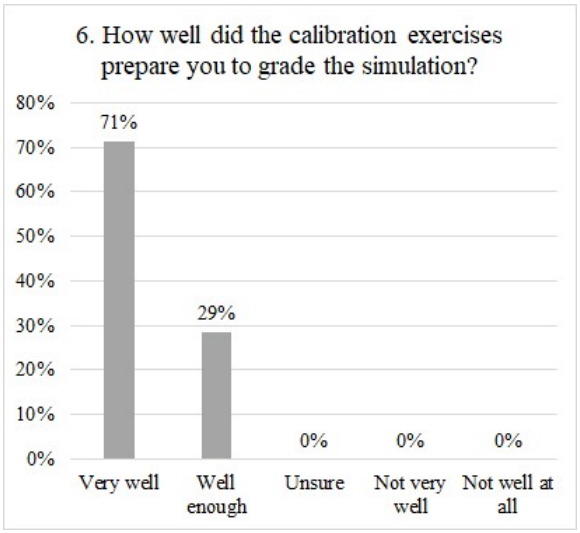


Figure 9. Proportion of different responses to Examiner Survey Question 6.

The grading criteria are nearly the same as the criteria used for the standard Operative Section, except for the removal of a few items, such as caries, pulp exposure and rubber dam isolation that do not apply for the Operative Simulation section. Question 7 asked the field-test examiners how well the modified criteria work for the simulation. Figure 10 shows the percentages of each response. Six examiners (86%) responded "Very well" or "Well enough," evenly split between the two responses. One examiner responded "Unsure." Only one comment was offered, "I think it's easier to see mistakes on a manikin than in the mouth."

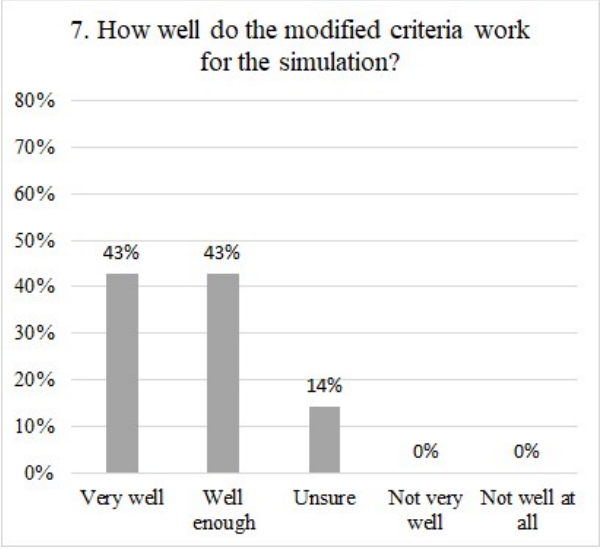


Figure 10. Proportion of different responses to Examiner Survey Question 7.

Question 8 asked field-test examiners whether they felt it was easier or more difficult to assess candidate performance with each candidate having received the same preparations. Figure 11 shows the percentages of each response. Five examiners (71%) felt it was easier, with four of them responding "Definitely easier" and one, "Somewhat easier." Two examiners (29%) responded "About the same." Comments included, "I would say that it levels the playing field and we still saw plenty of variation in performance for the finished restoration. Good simulation", "It was more fair to the candidates!", "Loved that part" and "As you see the same procedures over and over it becomes easy to compare and evaluate."

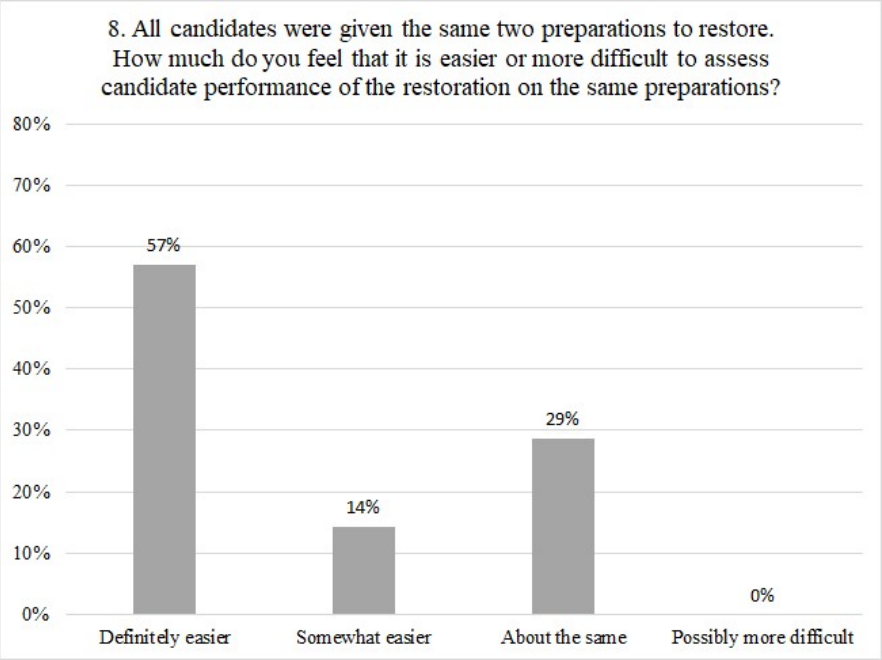


Figure 11. Proportion of different responses to Examiner Survey Question 8.

The section at the end inviting other comments or suggestions elicited one generic positive comment and two substantive comments suggesting that the Operative Examination Committee should consider including a means of failing or deducting points for examiner-validated gross open contact, e.g., "Grading for open contact is somehow still passing the candidate which I think it needs to be one of the automatic failure situations." Changes to criteria descriptors that will impact scoring and address the suggestions made in the comments have been prepared and recommended to the committee for implementation.

Field Test Results: Candidate Performance and Test Quality

Table 7 provides basic descriptive statistics for the raw and weighted means of medians computed from the three sets of examiner grades for each criterion. Direct comparisons to the standard Operative Section, particularly regarding criterion scores, are limited due to three factors. One is that only 5.5% of procedures performed for the standard Operative Section in 2019 were Class III procedures. All field-test attempts on the Operative Simulation Section included a Class III procedure. Since 2018, most states are accepting the results of performance on one Class II procedure if competence is demonstrated, so many candidates are completing Class II procedures. Years of Operative Section data have shown that the Class III is slightly, but significantly, less challenging than any Class II procedure and therefore, if completed, must be in combination with a Class II procedure. The second limiting factor is that many arches completed in the first, smaller field test, were modified to create additional exemplars of grading criteria performance levels during the development calibration materials and some performance levels may not be distributed within the sample in a comparable manner. The third factor is that the field-test host schools, which were chosen for location and convenience, given the conditions posed by COVID-19 and their students may not be a representative sample of all potential candidates.

Despite field-test limitations to direct comparison, three criteria and final scores (which include point deductions from penalties and loss of all points due to critical errors) were highly comparable. The slightly higher final score mean reflects a more negatively skewed distribution in the field test data; the passing percentage is actually somewhat lower for the field test than the standard Operative section in 2019. The significantly higher means of raw scores and some criteria for the field-tests may be related to the difference in procedure type in the comparison, particularly for Anatomical Form and Margins, which have traditionally scored significantly higher for the Class III procedure. Recent additions, since the field-test, to the criterion definitions for Internal Form related to grading examiner feedback are also expected to result in higher comparability.

Table 7. *Grading Criteria and Section Scores for Standard Operative Section and Operative Simulation Field Test: Means and Standard Deviations of Raw Unweighted Class II Median Criterion Scores, Raw and Final Scores, with t-Tests. Included are t values, probability values (p), effect size values (Cohen's d) degrees of freedom (df), and alpha level (α), i.e., significance below 0.05. Number of procedures noted as N_p, number of attempts noted as N.*

	Standard Operative Section 2019 N_p = 2,553[a]		Operative Simulation Field Test 2020 N_p = 164[a]		*t*-tests *df* = 2,715; α = 0.05		
	Mean	*SD*	Mean	*SD*	*t* value	*p* value	Cohen's *d* [b]
Outline and Extension	3.63	0.75	3.65	0.85	-0.27	0.79	0.02
Internal Form	3.62	0.74	3.85	0.65	-3.90	<0.01	0.33
Operative Environment	4.27	0.67	4.19	0.76	1.42	0.16	0.11
Anatomical Form	3.60	0.70	3.99	0.81	-6.86	<0.01	0.52
Margins	3.65	0.66	3.99	0.72	-6.32	<0.01	0.49
Finish, Function, & Damage	3.94	0.59	3.88	0.85	1.23	0.22	0.08
	N = 2,166		*N* = 82		*df* = 2,246		
Overall Raw Score	3.74	0.46	3.88	0.44	-2.76	0.01	0.31
Overall Final Score (with Penalties)	3.71	0.53	3.75	0.75	-0.69	0.49	0.06

[a] Only 5.5% of procedures performed in 2019 were Class III; 50% of Field test Procedures were Class III

[b] Generally accepted interpretations of Cohen's *d* effect size values are small, *d* = 0.2, medium, *d* = 0.5 and large, *d* = 0.8 (Cohen, 1988)

Table 8 provides field-test summary results from the many-faceted Rasch model (MFRM) analysis for graded criteria in logit, i.e., log-odds, values, with results from the 2019 standard Operative Section for reference. The MFRM analysis reported in Table 8 reflects the first day of grading, with complete sets of three grades per examination attempt. Mean-square fit statistics and discrimination parameter estimates are within suggested ranges. Since the criteria have multi-point

rating scales they were also assessed for category functioning, as well, in accordance with Linacre's (2002) rating scale guidelines to assess, e.g., that average parameter estimates of candidate ability increase with each category scale point.

Table 8. *Standard Operative Section and Operative Simulation Field Test: Many-Faceted Rasch Model Criterion Analysis Indicators in Logits.*

	Standard Operative Section 2019 $N = 2{,}166$	Operative Simulation Field Test 2020 $N = 82$
Criterion Measure Logit (Range)	-0.78 – 0.39	-0.37 – 0.43
Standard Error (Range)	0.02 – 0.02	0.08 – 0.10
Criterion Measure Logit Mean[a]	0.0	0.0
Criterion Measure Logit *SD*	0.50	0.25
Many-Facet Point-Biserial *r*[b] (Range)	0.25 – 0.32	0.23 – 0.37
2pl Discrimination Estimate[c] (Range)	0.92 – 1.08	0.76 – 1.10
Infit Mean-Square (Range)	0.93 – 1.07	0.85 – 1.19
Outfit Mean-Square (Range)	0.92 – 1.08	0.85 – 1.21

[a] Mean of criterion parameters constrained at 0

[b] Correlation between observations and corresponding average observations, excluding current observation

[c] Estimate of discrimination parameter, as calculated for two-parameter logistic IRT model; Rasch (c.f., one-parameter IRT) model fit requires values close to 1.00 (i.e., between 0.5 to 1.5 logits)

Table 9 provides summary statistics for overall test functioning, with 2019 standard Operative Section results for reference. The MFRM analysis reported in Table 9 also reflects the first day complete sets of three grades per examination attempt. Results are highly comparable, even with the large difference in sample size and limitations regarding comparisons noted earlier. The reliability estimate for the Operative Simulation Field Test is quite high for a performance-based assessment, at 0.91, which likely reflects the uniformity of the simulated teeth, in addition to high levels of examiner agreement. An additional MFRM analysis was conducted including all

examiner grades from both days of grading, yielding similar results and an even higher reliability estimate of 0.93, providing additional evidence of calibration effectiveness. (The Rasch person separation reliability estimate is the same or lower than Cronbach's alpha coefficient estimates of internal consistency reliability [Cronbach, 1951]. Minimum and maximum scores are excluded, if applicable; note that in the Many-faceted Rasch Model analysis, minimum and maximum refers to all raw grades, not median grades). Final score statistics include zero scores, which result from validated critical errors.

Table 9. *Standard Operative Section and Operative Simulation Field Test: Overall Test Summary Statistics*

Indicator	Standard Operative Section 2019	Operative Simulation Field Test 2020
N Attempts	2,166	82
Final Score Mean	3.71	3.75
Final Score *SD*	0.53	0.75
Minimum; Maximum	0.00; 5.00	0.00; 4.68
Standard Error of Measurement *(SEM)*	0.21	0.23
Conditional *SEM* at Passing Score	0.08	0.09
Indicators below are reported in logits.		
Candidate Ability Estimate Mean	1.54	1.08
Candidate Ability Estimate *SD*	0.87	0.80
Candidate Ability Estimate Min.; Max.	-2.02; 5.04 (-5.59[a]; 5.04)	-0.71; 2.89
Person Separation Reliability Estimate[b]	0.85	0.91

[a] If minimum score(s) included: Facets software flags minimums and maximums and estimates test statistics with and without extremes

[b] Equivalent to alpha coefficient internal consistency reliability estimate (Cronbach, 1951), or lower than alpha, since minimum (zero) and maximum (perfect) scores are excluded

The percentage of candidates that scored at or above the passing cut score on the Operative Simulation field tests was 92.7% (76 out of 82). The passing percentage for the second, larger field test was lower than that of the first, due to penalties, including two attempts with validated critical errors (e.g., treated the wrong tooth) that lost all points. Table 10 provides passing percentages for the two Operative Simulation field tests, with the 2019 standard Operative Section passing percentage for reference.

Table 10. *Standard Operative Section and Operative Simulation Field Test: Passing Percentages*

	N Attempts	Passing Count	Failing Count	Passing Percentage
Standard Operative Section 2019 Season	2,166	2,079	87	96.0%
Operative Simulation Field Test 2020 - Total	82	76	6	92.7%
Field Test First Site March 30, 2020 (U. of OK)	20	19	1	95.0%
Field Test Second Site April 1-2, 2020 (U. of UT)	62	57	5	91.9%

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Agenda Item (5)(a):

WREB:
Overview of 2021 Dental Examination and Results for 2020 Year to Date

WREB Dental Examination 2021

WREB has understood the need for alternatives to patient-based examination. In 2020, in response to the COVID-19 pandemic, WREB developed and administered a non-patient dental examination for states seeking licensure options for recent graduates. WREB has recently announced its development and finalization of an operative dentistry simulation section that requires preparation of teeth with simulated caries and a periodontal manikin section. Both sections will be available in 2021 after field-testing and analyses to evaluate examination validity are completed this fall. All five Dental Examination sections available in 2021 are described below and followed by a brief overview of examination results for 2020 year-to-date.

Comprehensive Treatment Planning (CTP) Section. CTP is a performance-based, examiner-graded section that requires candidates to review three patient cases and create treatment plans, construct responses to questions, and perform tasks (e.g., write prescriptions). CTP requires broad understanding of diagnostic, preventive, restorative, endodontic, periodontal, prosthodontic, oral surgical, radiological, pediatric dentistry, and patient-management procedures. Failure can result if a candidate commits a critical error, i.e., constructs a response that could result in life-threatening harm, e.g., administering more than the upper limit of a safe dose of local anesthetic to a pediatric patient.

Endodontics Simulation Section. The Endodontics Section is a performance-based, examiner-graded clinical simulation examination. Candidates must perform two endodontic procedures on simulated teeth mounted in a segmented arch which is mounted in a manikin that is positioned to simulate working on a patient. The anterior tooth procedure requires treatment of a maxillary central incisor simulated tooth, including access, instrumentation and obturation. The posterior tooth procedure requires access of a mandibular first molar simulated tooth. Access of the posterior tooth must enable grading examiners to identify all canal orifices.

Prosthodontic Simulation Section. The Prosthodontics Section is a performance-based, examiner-graded clinical simulation examination. Candidates complete two prosthodontic procedures (three preparations) on simulated teeth in a mounted articulator and manikin that is positioned to simulate working on a patient. Candidates are required to prepare an anterior tooth for a full-coverage crown and prepare two abutments to support a posterior three-unit fixed partial denture prosthesis (i.e., bridge). The three-unit bridge must have a path of insertion that allows full seating of the restoration.

Periodontics Section. The Periodontics section will be available in either a patient-based form or simulation form. The patient-based form is unchanged. The simulation form will not involve qualifying a patient but will involve the removal of subgingival calculus on teeth in an assigned quadrant mounted in a manikin to simulate performing the procedure on a patient. Grading criteria and scoring for the removal of calculus are as published for performance of the same task on a patient. Candidates can choose to waive or to challenge either the patient-based form or simulation form of the Periodontics section depending on the requirements of the state where they intend to become licensed. As for other simulation sections, an onsite retake opportunity may be available

for the simulation form of the Periodontics section, absent a critical error, depending on candidate logistics and circumstances.

Operative Dentistry Section. The Operative section will be available in either a patient-based form or simulation form. The patient-based form is unchanged. The simulation form involves performing a Class II (composite or amalgam) and a Class III composite restoration on a posterior tooth and anterior tooth, respectively. The teeth for preparation have a simulated caries, a DEJ, dentin, enamel, and a pulp chamber. The depth of the simulated caries will require candidates to modify their preparations. As in the past, most modifications will be initially reviewed by a Floor Examiner. Both preparation and restoration will be accomplished with full clinical simulation and with rubber-dam isolation. Candidates can choose to challenge either the patient-based form or simulation form of the Operative section depending on the requirements of the state where they intend to become licensed. As for other simulation sections, an onsite retake opportunity may be available for the simulation form of the Operative section, absent a critical error, depending on candidate logistics and circumstances.

WREB Dental Examination Results 2020 Year-to-Date (YTD)

WREB began administering an alternative dental clinical examination to dental licensure candidates in the spring of 2020 in response to limits on patient-based assessment options posed by the COVID-19 pandemic. The first entirely non-patient WREB Dental Examination was administered in early June of 2020. The examination season is not yet over until early November but twenty-two non-patient examinations have already been conducted in twelve states between early June and the end of August (1,635 exam attempts). The first six examinations of the season administered in six states between February and early March included patient-based sections (298 exam attempts).

A comparison of pass or fail outcomes on the Dental Examination between the 2019 season (32 examinations; 2,411 exam attempts) and the 2020 season, year-to-date (28 examinations, 2,198 exam attempts) indicates no statistically significant difference in proportion passing between 2019 (85.6% passing) and 2020 YTD (85.0% passing)[1]. Figure 1 displays passing percentages for 2019 and 2020 YTD for each Dental exam section and for overall passing status. Section passing percentages are higher than overall passing percentages due to the requirement that all sections attempted must be passed to attain overall success on the Dental exam.

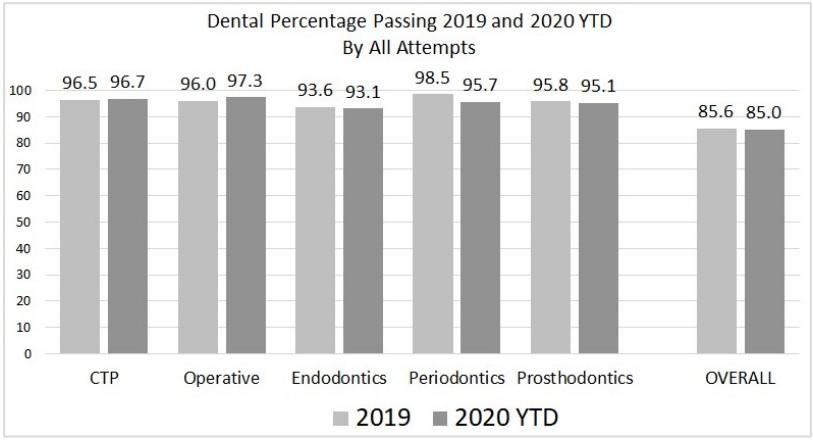
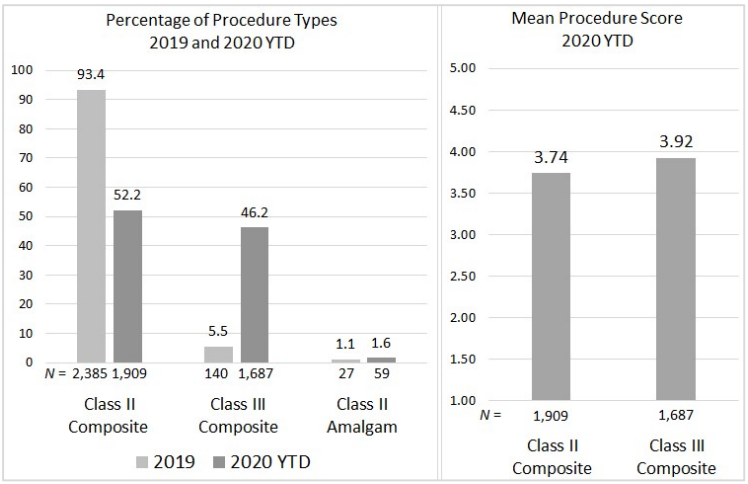


Figure 1. Dental passing percentages for 2019 (2,411 exam attempts) and for 2020 year to date (2,198 exam attempts by September 25, 2020). Note that section passing percentages are higher than the overall percentages because passing the Dental exam requires passing all sections attempted.

Two exam sections show differences for 2020 that are greater than expected across seasons. The patient-based Periodontic section was included in only 15.3% of examination attempts making the impact of individual school performance a highly influential factor in comparison. The Operative Dentistry passing percentage is 96.0% for 2019 and 97.3% for 2020 YTD. The difference does not appear to be due to a significant difference in the level of challenge between the manikin and patient-based examination, but rather is due to an extremely large difference in the proportion of Class III procedures completed for the manikin Operative exam compared to previous exam seasons. The Class III procedure was optional until the introduction of the manikin exam in 2020, which requires completion of one Class II procedure and one Class III procedure. In 2019, only 5.5% of procedures completed were Class III, compared to 46.2% of procedures in 2020 YTD, where 84.6% of all 2020 YTD attempts have been manikin-based. Figure 2a displays the percentage of procedure types completed in 2019 and 2020 YTD. Candidate performance on the Class III procedure has been slightly but consistently higher since 2008, when the Class III became a regular procedure option (i.e., an average of 4.3% higher mean scores per season on Class III than Class II). Figure 2b shows the mean procedure scores for the Class II and Class III composite procedures. The Class III mean is 4.8% higher in 2020 YTD, which is consistent with past results for the Class III procedure and provides evidence that the increase in Operative passing percentage from 96.0% to 97.3% is likely due to the abundance of Class III procedures performed rather than the introduction of the manikin version of the Operative section.



Figures 2a and 2b. (a) Percentage of procedure types completed in 2019 and 2020 YTD. Class III procedures are optional in the patient-based exam (only 15.4% of 2020 YTD attempts were patient-based). Every attempt in the manikin exam (84.6% of 2020 YTD attempts) includes a Class II and Class III. (b) Mean (average) procedure score for Class II and Class III Composite procedures. Number of procedures is provided by "*N* =" for both graphs.

In addition to comparability in candidate performance, the non-patient dental examination is also showing comparability in examiner quality, exam site comparability, and technical indicators. Additional details of WREB Dental Examination content, results, and technical quality are available upon request.

[1] Results of chi-square analysis [Dental Pass/Fail and 2019/2020 YTD]: χ^2 (df =1, N = 4,609, α = 0.05) = 0.35; Fisher's Exact significance p = 0.56; effect size Cramér's V < 0.01.

Agenda Item (5)(a):

WREB:
Overview of 2021 Dental Hygiene Examination and Results for 2020 Year to Date

WREB Dental Hygiene Examination 2021

WREB has understood the need for alternatives to patient-based examination. In 2020, in response to the COVID-19 pandemic, WREB developed and administered a Dental Hygiene OSCE examination for states seeking licensure options for recent graduates. WREB has recently announced its development and finalization of a manikin examination as another initial licensure alternative for 2021. Dental Hygiene Examination alternatives available in 2021 are described below and followed by a brief overview of examination results for 2020 year-to-date.

Dental Hygiene Clinical Examination. The Dental Hygiene Clinical Examination will be available in either a patient-based form or manikin-based form. The patient-based form is unchanged. The manikin exam is comprised of two sections: Assessment Detection and Removable Calculus. Each section is completed on a simulated quadrant that must be mounted in a typodont and positioned to simulate the treatment of a patient. WREB has worked to develop a more realistic colored calculus and periodontal assessment model.

- The Assessment and Detection section requires the candidate to assess periodontal conditions, accurately record periodontal measurements, and note the presence of subgingival calculus on a maxillary quadrant.

- The Removable Calculus has subgingival calculus (of various sizes) placed throughout the quadrant. Candidates must successfully remove the designated key surfaces using ultrasonic and/or hand instrumentation.

Prior to the administration of the manikin examination, a series of field tests will be conducted to ensure the validity of the examination. Field testing for the Removable Calculus section will begin in October and continue with final field testing for the Assessment Detection section. The manikin exam will be ready for implementation in 2021.

Dental Hygiene Objective Structured Clinical Examination (DH OSCE). The DH OSCE examination is a standardized, multiple-choice examination that employs images and radiographs to replicate authentic oral conditions and clinical situations. DH OSCE content focuses on the clinical aspects and knowledge-based skills necessary to safely treat a patient in a clinical setting. The content categories assessed are medical history, risk assessment, extraoral/intraoral examination, periodontal assessment, dental hygiene care/treatment plan, and instrumentation. The DH OSCE is tailored to specific clinical aspects of dental hygiene care in order to evaluate critical thinking skills that cannot be assessed comprehensively on the clinic-based examination. The examination is administered at dental hygiene schools by WREB personnel with social distancing and adherence to current COVID-19 guidelines. Site-based administration eliminates the need for students to wait for availability at a testing center.

WREB Dental Hygiene Examination Results 2020 Year-to-Date (YTD)

In response to requests for alternatives to patient-based examination due to the COVID-19 pandemic, WREB developed a computer-based alternative assessment that approximates the critical thinking and decisions involved in clinical practices since a sufficiently valid and defensible alternative typodont simulation was not yet available. WREB began administering the Dental Hygiene OSCE to dental licensure candidates in the June of 2020. The DH OSCE examination is a comprehensive, computer-based Objective Structured Clinical Examination (OSCE) format that employs images and radiographs to replicate authentic oral conditions and clinical situations. The examination has been administered at sixteen different sites for a total of 617 exam attempts. Some examination sites have resumed patient-based examinations under enhanced infection-prevention conditions. Twenty-two patient-based examinations have taken place for a total of 690 exam attempts in 2020, so far.

Results for 2020 year-to-date have been comparable to results from previous years. Figure 1 shows passing percentages for the Dental Hygiene Examination for 2019 and 2020 YTD. The passing percentages for all attempts includes all attempts, including retakes. The first-attempt passing percentages reflect each candidate's first attempt, only. The retakes passing percentages reflect re-examination results for candidates with previous failures, only. First attempts are higher, since most candidates are able to demonstrate competence the first time challenging the examination. Some candidates who fail upon first attempt, may be truly competent, but were unable to demonstrate competence on the day of the exam. Retakes allow a candidate the opportunity to demonstrate competence again. The likelihood that a truly competent candidate will continue to perform unsuccessfully after multiple retakes becomes lower with each subsequent attempt. Remediation is required after three failures of the examination.

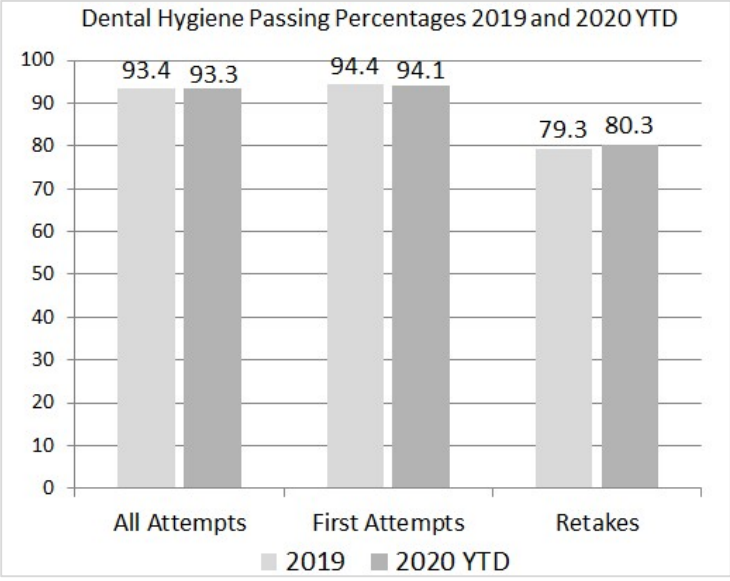


Figure 1. Dental Hygiene passing percentages for 2019 (1,806 exam attempts) and for 2020 year to date (1,307 exam attempts by September 25, 2020).

While the combined examination results are highly comparable, the results for the DH OSCE are slightly higher, (i.e., 95.8% passing), compared to the patient-based examination (i.e., 91.0%) so far in 2020, than for the patient-based examination. However, the retake passing percentage for the DH OSCE (63.6%) is far lower than the retake passing percentage for the patient-based examination (between 75% and 80% for many years) which suggests that the DH OSCE is highly discriminating regarding demonstration of competence.

Major indicators of technical quality for the DH OSCE remain consistent since the initial evaluation prior to operational administration. Estimated values of Cronbach's alpha coefficient of internal-consistency reliability are 0.70 for each test form, which is reasonable for criterion-referenced competency assessment since alpha reliability estimates depend upon sample variability and are attenuated due to the high level of candidate preparedness. Other indicators, such as the Brennan-Kane $\Phi(\lambda)$ index of dependability and Peng-Subkoviak P_0 estimates of classification consistency provide insight into the reliability of pass-fail outcomes. Dependability index values, which take item variance into account, are high, with values of 0.92 for each test form. Classification consistency values are even higher, with values of 0.97 for each test form, given that mean scores are far enough above the passing cut-score to make misclassification less likely. The mean scale score and passing percentages for each form are identical and no significant difference in pass/fail outcome has been found between forms (χ^2 (1, N=617) < 0.0001, Fisher's Exact significance p = 1.00, Cramér's V < 0.001). Candidates can expect no difference in level of challenge or test outcome regardless of test form assigned.

Additional details of WREB Dental Hygiene Examination content, results, and technical quality are available upon request.

Agenda Item (5)(b):

ADEX:
Use of Manikin in Dental Hygiene and Dental Periodontal Scaling

(previous temporary approval and acceptance of same by Board on 9/15)

ADEX
AMERICAN BOARD OF DENTAL EXAMINERS, INC.

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ADEX™ Approves Use of Typodont In Dental Hygiene and Dental Periodontal Scaling Clinical Licensure Examinations

2020 ADEX™ Press Release

For Release: May 18, 2020
Email Inquiries: office@adexexams.org

LAS VEGAS, NEVADA — The American Board of Dental Examiners, ADEX™, has approved the use and offering of a selected typodont as an option in the dental hygiene licensure examination and the dental periodontal scaling challenge. The typodont selected will be used in calculus detection, calculus removal, and periodontal probing exercises for the ADEX Dental Hygiene Patient Treatment Clinical Examination after completing a feasibility study under the supervision of ACS Ventures, LLC. This will offer dental hygiene licensure boards/agencies the choice to accept this non-patient professional proficiency demonstration or continue to accept the patient required participation for dental hygiene.

Further, the feasibility study included analysis of periodontal scaling proficiency utilizing the selected typodont and was accepted by the ADEX Board of Directors to be offered as an option for the periodontal scaling exercise part of the ADEX Dental Licensure Clinical Examination. This too would give licensure boards, that intend to accept a non-patient clinical assessment of candidates for licensure, an option for such acceptance of demonstrated proficiency.

"While facing circumstances as a result of the COVID-19 crisis, ADEX has endeavored to critically and psychometrically provide licensing jurisdictions options given the current conditions in delivery of dental education, dental treatment, and independent dental skills evaluation. With the previous addition of the CompeDont™ to the ADEX™ dental testing repertoire, licensure boards and agencies have additional non-patient assessment modalities upon which to aid in licensure evaluation during these unprecedented times. These hands-on skill assessments are joined by our computerized Objective Clinical Simulated Examination (OSCE) in both dentistry and dental hygiene, the longest running, continually maintained OSCE in the dental profession in North America," said ADEX President William G. Pappas, D.D.S. "ADEX™ has taken additional steps in dental hygiene by approving and offering both patient and non-patient demonstration options, if desired by licensing boards, to meet the current unique obstacles presented by the COVID-19 crisis," added Beth Jacko-Clemence, R.D.H, and Chair of the ADEX Dental Hygiene Examination Committee. This committee utilized practicing licensed hygienists, hygiene educators, and hygiene students to conduct the feasibility study prior to acceptance and adoption of the use of this particular typodont for examination purposes.

The offering of the typodont based dental hygiene examination and typodont based dental periodontal scaling exercise will commence this summer in the examination series currently scheduled to resume by both The Commission on Dental Competency Assessments (CDCA) and the Council of Interstate Testing Agencies (CITA). As always, it will be at the discretion of state licensing boards/agencies whether to accept these additional offerings in testing modality.

For any questions about the ADEX™ examination please contact: ADEX™ at office@adexexams.org For questions about the administration of ADEX examinations, please contact The Commission on Dental Competency Assessments at: www.cdcaexams.org or the Council of Interstate Testing Agencies at www.citaexam.com

ACS VENTURES
BRIDGING THEORY & PRACTICE

CDCA Typodont Evaluation Report for the ADEX Dental Hygiene Examination

May 29, 2020

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Introduction

In April 2020, the Commission on Dental Competency Assessments (CDCA) conducted a product evaluation of a simulated patient (i.e., typodont). The evaluation was designed to determine the suitability of the typodont for use in a clinical skills (i.e., psychomotor skills) assessment for dental hygiene candidates. The results of the evaluation include the summary judgements of 30 subject matter experts (SMEs) who were each provided a typodont and a web based survey for data collection on their experience and perceptions. The CDCA identified ACS Ventures, LLC (ACS) to assist with the design of the product evaluation study and then independently analyze the results. This report summarizes the methodology, results, and conclusions of the study.

Study Method

To determine the feasibility of using a typodont in the assessment of prospective dental hygienists, multiple sources of validity evidence were collected and analyzed. This evidence consisted of a review of the content and response processes, reliability, and fairness. Content and responses processes were specifically aimed at the degree to which the typodont represents actual practice and the degree to which tasks and scoring criteria remain consistent between modes. It is both pragmatic and a matter of industry expectations (AERA, APA, & NCME 2014) to evaluate the effect of adding or transitioning to a new administration mode. The use of a typodont in the assessment represents a potential, additional mode option if jurisdictions are not able to administer the current examination.

The pursuit of the validity evidence is in service to two evaluation questions: Does the proposed mode result in technical characteristics that are comparable to the current mode? Does the proposed mode yield comparable evidence to support conclusions about entry level competency?

The study consisted of 30 SMEs who served as field test participants. They completed periodontal probing before and after treatment (i.e., instrumentation), calculus detection, and calculus removal skills on the typodont. These field testers included students, dental hygiene faculty, and practitioners.

Quantitative Data Analyses and Summary

The quantitative data collected were with respect to the amount of agreement among SMEs regarding the pocket depth determined both pre- and post-treatment, and the presence and size of calculus deposits prior to scaling. These data were evaluated for the percent of interrater agreement on each of these skills and were observed to be relatively high (from 82% to 95%). This source of reliability informs readers as to the consistency of the SME judgements for each skill evaluated in this study. In addition, historical reliability data regarding probing, detection, and removal were used to check the reasonableness of the new findings. These data are presented in the following table.

Table 1 – Periodontal probing, calculus detection, and calculus removal agreement results

	Field Test	2018	2016
Perio probing – Pre-treatment (+/- 1 mm)	93%	96%	95%
Perio probing – Post-treatment (+/- 1 mm)	95%	N/A	N/A
Calculus detection – Presence and absence (S/M/L)	82%	85%-91%	86%-90%
Calculus detection – Presence and absence (M/L only)	85%	N/A	N/A
Calculus detection – Presence and absence (L only)	92%	N/A	N/A
Calculus removal	92%	91%	N/A

As shown in the table, the calculus detection analysis was performed for different combinations of deposit sizes. Small, medium, and large deposits are represented by the letters S, M, and L, respectively. The least amount of agreement was found in the calculus detection activity when all three sizes of deposits were included in the rate. This rate represents a relatively high rate of agreement and is within 4% of the historical rates of comparison. When deposits were limited to just the medium and large, or just large, the level of agreement increases. Additional discussion of deposit size is included in the next section of this report.

The periodontal probing analysis was performed as a strict interrater agreement rate using the most prevalent examiner rating (i.e., mode) as the reference criterion. For this analysis, SMEs were determined to have agreed when they agreed with each other to a tolerance of plus or minus one millimeter. This metric was chosen as an alternative to a measure of agreement with the intended pocket depth suggested by the typodont manufacturer given. In approaching the analysis in this way, we were able to replicate the current practice on the patient-based examination.

Qualitative Data Analysis and Summary

Field testers were also asked to complete a qualitative survey regarding their experience with and perceptions of the typodont. This survey consisted of three question types: dichotomous questions for which a yes or no choice must be made; a 5-response option Likert rating from strongly disagree to strongly agree; and open ended comment questions, some of which were prompted by a "No" response from questions of the first type.

The survey aimed to collect data in six categories: Calculus Detection; Calculus Removal; Tissue; Periodontal Probing; Typodont Teeth; Ultrasonic Usage. The data were analyzed by category, response type, and SME type (non-student and student). The yes or no questions were with respect to the operational aspects of the typodont and were generally answered favorably across all categories. The Likert items were designed to measure the degree to which the SMEs believed the experience was realistic. The most prevalent responses to these survey questions were "Agree" and "Not ideal, but sufficient." Finally, the open-ended comments were coded and counted. The recurrent comments were split between favorable and unfavorable across categories expressing a neutral disposition toward the typodont.

The following highlights the qualitative survey results:

Calculus Detection

- Realistic feel of calculus deposits? – Yes (73%), No (27%)
- Realistic placement? – Yes (87%), No (13%)
- Detection similar to that of a patient? Agree (30%), Sufficient (37%), Disagree (33%)
- Respondent Comments:
    - Calculus is too smooth
    - Stiffness of the tissue limited accuracy
    - Calculus deposits difficult to detect
    - Burnished/small deposits were difficult to detect

Calculus Removal

- Deposits come off in layers? – Yes (80%), No (20%)
- Realistic using hand instruments? – Yes (77%), No (23%)

- Removal similar to that of a patient? Agree (57%), Sufficient (23%), Disagree (20%)
- Respondent Comments:
    - Tooth material came off with hand scaling
    - Calculus behaved realistically
    - Teeth became loose/fell out
    - Teeth were soft

Tissue

- Did the sulcus remain intact after scaling? – Yes (90%), No (10%)
- Could you damage the tissue while hand scaling? – Yes (60%), No (40%)
- Tissue simulates the gingiva found with a patient? Agree (33%), Sufficient (33%), Disagree (33%)
- Respondent Comments:
    - Impressed with tissue
    - Tough/rubbery tissue
    - Not realistic
    - Realistic tissue

Periodontal Probing

- Distinguish between enamel and cementum? – Yes (53%), No (47%)
- Mobility during scaling? – Yes (37%), No (63%)
- Teeth similar to that of a patient? Agree (37%), Sufficient (27%), Disagree (36%)
- Respondent Comments:
    - Tooth/teeth came out
    - Teeth are soft
    - Teeth did not move when scaled
    - Did not have gloss or sheen as expected

Typodont Teeth

- Distinguish between enamel and cementum? – Yes (53%), No (47%)
- Mobility during scaling? – Yes (37%), No (63%)
- Teeth similar to that of a patient? Agree (37%), Sufficient (27%), Disagree (36%)
- Respondent Comments:
    - Tooth/teeth came out
    - Teeth are soft
    - Teeth did not move when scaled
    - Did not have gloss or sheen as expected

Ultrasonic Usage

- Eleven SMEs in the study an ultrasonic scaler.
- Was there any negative effect on the tissue with the ultrasonic? Yes (0%), No (100%)
- Was there any damage to the tooth surface by the ultrasonic? Yes (36%), No (64%)
- Calculus removal experience was similar to a patient? Agree (55%), Sufficient (37%), Disagree (9%)
- Respondent Comments:
    - Teeth are soft
    - Realistic

Conclusions

Regarding the technical characteristics of the current mode, examiner agreement for probing, calculus detection, and calculus removal was comparable with historical rates. Regarding the degree to which the mode yields comparable evidence to support conclusions about entry level competency, the study found that small and some medium deposits were more difficult to detect and may not represent entry-level skills.

The qualitative data indicated that, with some caveats noted in ratings and comments, the typodont was realistic. Field tester responses to the survey questions were a mixture of favorable and unfavorable ratings which were significantly skewed towards favorability. Therefore, the collection of evidence supports use of this typodont in ADEX examination exercises for jurisdictions that may want to offer both a psychomotor performance examination and a fully non-patient licensure pathway. Notwithstanding this conclusion, the data also suggests that a patient-based demonstration of clinical skills remains a superior comparative option.

References

American Educational Research Association (AERA), American Psychological Association (APA), & National Council on Measurement in Education (NCME) (2014). *Standards for educational and psychological testing*. Washington, D.C.: American Educational Research Association.

ACS VENTURES
BRIDGING THEORY & PRACTICE

CDCA High Fidelity Restorative Simulation Mode Effects Study

April 20, 2020

Prepared by:
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Chad W. Buckendahl, Ph.D.

Introduction

In 2019, the CDCA began data collection for a study to evaluate a new type of simulated tooth – the CompeDont™ DTX High Fidelity tooth – as a possible alternative for the demonstration of skills in the ADEX dental licensure examination. Although development of the tooth had been occurring for a few years prior, this was the first larger scale effort to review the performance in a testing setting. The CDCA identified ACS Ventures, LLC (ACS) to evaluate the fidelity of this tooth through a mode effects study where use of this CompeDont™ tooth in a examination setting was compared to traditional examination results. A mode effects study is designed to evaluate examinees' performance on knowledge, skills, or abilities that are administered in more than one format or mode. Common types of mode effects studies are ones that compare a testing program that is administering a test using paper-pencil and computer-based formats. For a clinical skills demonstration, the administration modes being compared in this study are a simulated tooth in a typodont versus a natural tooth in a patient. Specifically, this evaluation compared candidate performance, types of errors, and rater agreement. This report summarizes the results of this study.

Data and Analyses

In Fall 2019, the CDCA partnered with six dental schools to conduct pilot administrations of the Anterior Restoration procedure (inclusive of preparation and restoration) of the ADEX examination using the CompeDont™ tooth. In total, 548 examinees completed the Anterior Restoration. Examinees represented a diverse group of students from schools selected from multiple geographic regions. In addition, 238 of these examinees (43%) also completed the Posterior Restoration part of the ADEX examination on a patient (i.e., standard administration conditions) as a point of comparison. Across the six administration sites, 66 trained and calibrated examiners participated in the study by evaluating the performance on CompeDont™ and/or natural teeth.

Posterior Restoration

Because this was a pilot exam set up for the mode effects study, the first focus of the analysis was on the Posterior Restoration tasks that 43% of the examinees completed using a patient as they would in the current operational examination. The purpose of including this element in the study was to determine how performance in the pilot exam compared to an operational exam environment. Specifically, the results from this administration allow for a direct comparison to the results from the 2019 and 2018 operational examination results (e.g., pass rate, types of errors). The results (see Table 1) indicate the pass rate for the pilot exam was slightly lower than the 2019 examinations (5% lower) and the 2018 examinations (3% lower). This observation may be due to variation in the sample of examinees relative to the population. In addition, this may also be somewhat influenced by the timing of the study occurring a few months earlier in the training program than when candidates generally take the examination.

Looking closer at the performance of examinees, the most frequent errors were identified from each administration mode. For the preparation part of the task, the same three errors (Caries, Gingival Contact, Adjacent Tooth Damage) were the most frequent for both the pilot exam and the operational examinations. For the restoration part of the task, there were two consistently frequent errors – interproximal contact and margin excess. Finally, the rater agreement (i.e., how often ratings were confirmed) was consistently high between the operational administrations and the mock exam. This collection of evidence suggests that examinees performed similarly in this pilot exam as they would on an operational examination with a slightly lower pass rate. Therefore, even though the new CompeDont™ tooth was tested in a pilot exam (not an operational one), the results are likely to be comparable to those from an operational exam.

Table 1. Comparison of Posterior Restoration Results – Pilot Exam vs. 2018/2019 Operational Exams

	Mock Exam	2019 Operational Exam	2018 Operational Exam
Pass Rate	90%	95%	93%
Most Frequent Errors – Preparation	Caries Gingival contact Adjacent tooth damage	Caries Gingival contact Adjacent tooth damage	Caries Gingival contact Adjacent tooth damage
Most Frequent Errors – Restoration	Interproximal Contact-open/irregular Margin Excess Centric/Excursive Contacts	Interproximal Contact – open irregular Margin Excess Margin Deficiency	Interproximal Contact – open/irregular & closed Margin Excess Margin Deficiency
Rater Agreement	98%	98%	98%

Anterior Restoration

All Anterior Restorations were performed on the CompeDont™ tooth and, given the comparability of the pilot exam results for the Posterior Restoration, the results of this administration were compared to those from the 2018 and 2019 operational administration (see Table 2). The pass rate for the CompeDont™ tooth was meaningfully lower than the 2019 and 2018 examinations (15% and 14% lower, respectively). When examining performance on the preparation task, two types of errors (Caries Remaining and Outline Extension) were the most common for both the CompeDont™ tooth and operational administrations. For the restoration task, the same three errors were common between modes: Margin Excess, Interproximal Contact, and Margin Deficiency. Finally, the rater agreement was consistently high between the operational administrations with the patient and the pilot exam with the CompeDont™ tooth. This collection of evidence suggests that the CompeDont™ tooth was a similar, but more challenging, task for the examinees. Additional analysis to understand the differences in pass rates is described in the next sections of this report.

Table 2. Comparison of Anterior Restoration Results – CompeDont™ Tooth Pilot Exam vs. 2018/2019 Operational Exams

	CompeDont™ Tooth – Pilot Exam	2019 Operational Exam	2018 Operational Exam
Pass Rate	80%	95%	94%
Most common Errors – Preparation	Caries Remaining Outline Extension Axial Walls	Caries Remaining Unrecognized Exposure Outline Extension	Caries Remaining Gingival contact Adjacent tooth damage Outline extension
Most common errors – Restoration	Margin Excess Interproximal contact – open/irregular Margin Deficiency	Interproximal Contact – open/irregular Margin Excess Margin Deficiency	Interproximal contact – open/irregular Margin Excess Margin Deficiency
Rater Agreement	97%	98%	98%

To better understand the differences observed in the pass rates, the results from the CompeDont™ tooth were further explored to determine why 20% of the examinees in the sample failed the Anterior Restoration task. Table 3 shows the specific frequency by which the most common errors were observed for the preparation and restoration tasks between the CompeDont™ tooth-mock exams and the 2018 operational exam. The most notable difference is in the frequency by which a Caries Remaining error was

observed in the preparation task – 15% with the CompeDont™ tooth compared to less than 1% in the 2018 operational exam. To ensure this was not an artifact of the pilot exam situation, the frequency of Caries Remaining was evaluated for the Posterior Restoration. The 2018 operational administration resulted in 1% of examinees having a Caries Remaining error while the pilot exam showed 2.5% having a Caries Remaining error. Therefore, the difference observed in Table 3 is not an artifact of the study but rather likely due to intended design characteristics of the tooth that are further discussed next.

Table 3. Comparison of Error Frequency – CompeDont™ Tooth Pilot Exam vs. 2018 Operational Exam

	CompeDont™ Tooth – Pilot Exam	2018 Operational Exam
Preparation		
Caries	15%	<1%
3 Sub Rule: Outline Extension, Gingival Clearance, Axial Walls	7%	<1%
Restoration		
Margin Excess	2%	<1%
Interproximal Contact	1%	<1%

An important design feature of the CompeDont™ tooth is that carious lesions are presented in a way that is more representative of how caries are observed and treated in practice within a typical patient population. Specifically, the CompeDont™ tooth was designed to have varying degrees of average or moderate levels of caries present. This design characteristic requires candidates to exercise their clinical judgment in addition to their psychomotor skills. As a result, it was expected that virtually all CompeDont™ teeth would require modification from an ideal preparation to perform the procedure because of where the caries would be observed. This is different from the current examination where candidates bring their own patients and that a much smaller percentage of these require modifications.

During the examination, candidate requests for modification from an ideal preparation are handled procedurally through a review and approval process. As part of this study, candidate performance was further evaluated based on whether they requested a modification in the pilot exam and these results were compared to the 2018 operational exam. As shown in Table 4, there were many more modifications with the CompeDont™ tooth as compared to the operational exam (74% compared to 31%). As noted above, because the goal with the simulated tooth was to be more representative of job-related practice, this was expected. In fact, an even higher percentage of modifications for the CompeDont™ tooth were expected as compared with the current examination data. In the 2018 results, the pass rates between those who had a modification and those who did not are very similar (94% and 96%). However, the pass rates for the CompeDont™ tooth were much higher for those who had a modification compared to those who did not (83% compared to 73%).

Table 4. Comparison of Exam Results by Modification (Yes/No) – CompeDont™ Tooth Pilot Exam vs. 2018 Operational Exam

	CompeDont™ Tooth – Pilot Exam	2018 Operational Exam
Modifications (any approved)		
Count (%)	408 (74%)	1018 (31%)
Pass Rate	83%	94%
No Modifications		
Count (%)	140 (26%)	2264 (69%)
Pass Rate	73%	96%

A follow up question to this finding was whether the pass rate differentiation for the CompeDont™ tooth was due to examinees not knowing when to request a modification (when one was needed) or requesting the wrong modification. The results in Table 5 include the pass rate by whether examinees had any modifications approved and/or denied. The results show that most examinees either had all their modification requests approved (group 1) or did not request any modifications (group 4). The other two smaller groups were those that had at least one modification request denied (and at least one accepted – group 2, or none accepted – group 3). These results indicate that the highest pass rate was observed for those examinees who had one or more modification requests accepted (i.e., they understood what to request and when to request). In addition, 26% of examinees did not request a modification with their pass rate being notably lower (73%).

Table 5. Comparison of Exam Results by Modification Request Status

Modification Status	Count	Pass Rate
1. One or more approved (no denials)	325 (59%)	85%
2. One or more accepted & one or more denial	52 (9%)	77%
3. One or more requested – all denied	31 (6%)	71%
4. No modifications requested	140 (26%)	73%
Total	**548**	**80%**

Results and Conclusions

The purpose of this mode effects study was to evaluate the feasibility of the CompeDont™ tooth as a possible alternative to a patient for the ADEX Dental restoration examinations. Data were collected from pilot examinations administered to over 500 dental students from six different schools evaluated by over 60 examiners. The results of this analysis suggest the feasibility of the simulated tooth administered in a typodont as comparable to the operational examination based on the comparison of the Posterior Restoration results from previous administration results. Focusing on the Anterior Restoration, the results indicate that use of the CompeDont™ tooth was sensitive to identify the same critical deficiencies identified in the patient-based examinations. An additional feature of the use of the CompeDont™ tooth is that the normal variation observed in practice by dentists can be modeled to further evaluate candidates' clinical judgment in addition to their psychomotor skills.

Although limitations of the simulation include a lack of some of the patient-based characteristics (e.g., saliva, tongue, patient anxiety), the benefit of additional standardization of the environment for candidates and better representation of job-related characteristics of the tooth may outweigh these limitations. The lower pass rate observed during the pilot examination for the simulated tooth suggests that its use does not offer an easier pathway to licensure and may currently be more challenging. The question is whether it is a fair approach to measuring the clinical judgment and psychomotor skills needed for restoration procedures. The difference in pass rates may be explained in part by the timing of the pilot exam (e.g., examinees taking the exam at an earlier date than normal). However, most of the difference can be attributable to the lack of recognition of caries and a need to modify a preparation from the ideal when it is warranted. Evidence of high examiner reliability provides a source of support. When compared with the current examination where candidates select a patient on which to perform the procedure with rates of modification being relatively low, the CompeDont™ tooth may be a better representation of the job-related environment to measure the important clinical judgments and skills that candidates will need to demonstrate in practice.

THE COMMISSION ON
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ADEX Approves Non-Patient Clinical Examination Option for Dental Hygiene

For immediate release, May 21, 2020 | Linthicum Heights, MD

Direct inquiries to sbeeler@cdcaexams.org

Back to CDCA Newsroom

Exam Provides Psychomotor Performance Evaluation

The Commission on Dental Competency Assessments (CDCA) will soon be able to offer dental hygiene licensure candidates a new option to demonstrate readiness for practice. The American Board of Dental Examiners (ADEX) approved the use of a typodont for clinical examinations last week after reviewing an analysis and feasibility study. Read the ADEX announcement here.

The ADEX Dental Hygiene Committee approved the manikin-based option for use in the Patient Clinical Treatment Exam (PTCE) is a response to the COVID-19 crisis should states wish to require a psychomotor demonstration of skills in the absence of patients. The ADEX Examination for Dental Hygiene licensure is made up of two parts, the PTCE and the Computer Simulated Clinical Examination OSCE (CSCE OSCE). Examinations using the approved typodont will be available in early July through CDCA.

Earlier this spring the ADEX Dental Examination Committee approved use of the CompeDont™, a psychometrically validated simulated tooth, for use in the Restorative Examination for dentistry.

At least 11 states already permit the use of a manikin for dental hygiene examinations and/or accept the CSCE OSCE only for licensure. States seeking support in making these decisions are encouraged to contact the CDCA as representatives will be made available to participate in conference calls and meetings. The typodont is also approved for use in Periodontal Scaling assessments for dental licensure candidates.

Agenda Item (5)(c)

ADEX:
Restorative Exam
(previous temporary approval and acceptance of same by Board on 9/15)

Restorative Examination Performance: *CompeDont*™ vs. Patient Based

2020 Patient Based Restorative Candidates (n=2600+)

- Anterior Restorative = **94%** Pass Rate
- Posterior Restorative = **94%** Pass Rate
- Average = **94%** Pass Rate

2020 *CompeDont*™ Restorative Candidates n=880)

- Anterior Restorative = **95%** Pass Rate
- Posterior Restorative = **93%** Pass Rate
- Average = **94%** Pass Rate

*Data Courtesy of CDCA