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THE RELATIONSHIP BETWEEN EDUCATIONAL MOCK BOARDS AND CLINICAL  
BOARD EXAMINATIONS

by

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A thesis

submitted in partial fulfillment

of the requirements for the degree of

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## **Committee Approval**

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Victoria Martin find it satisfactory and recommend that it be accepted.

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“If we knew what it was we were doing, it would not be called research, would it?”

— Albert Einstein

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“What is that feeling when you're driving away from people and they recede on the plain till you see their specks dispersing? - it's the too-huge world vaulting us, and it's good-bye. But we lean forward to the next crazy venture beneath the skies.”

— Jack Kerouac, *On the Road*

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## **List of Abbreviations**

ADA: American Dental Association

ADEA: American Dental Education Association

ADHA: American Dental Hygiene Association

CODA: Commission on Dental Accreditation

DHE: Dental Hygiene Examination administered by WREB

DHNBE: Dental Hygiene National Board Examination

IRB: Institutional Review Board

ISU: Idaho State University

JCNDE: Joint Commission on National Dental Examinations

LAE: Local Anesthesia Examination administered by WREB

MB: Mock Board

RE: Restorative Examination administered by WREB

WREB: Western Regional Examining Board

## **Abstract**

### **THE RELATIONSHIP BETWEEN EDUCATIONAL MOCK BOARDS AND CLINICAL BOARD EXAMINATIONS**

Thesis Abstract – Idaho State University (2015)

**Purpose.** This study described dental hygiene, local anesthesia, and restorative educational MB characteristics and explored relationships between these characteristics and candidate performance outcomes on the corresponding WREB examinations.

**Methods.** Online questionnaires were used to collect 2013-2014 MB data from 23 entry-level dental hygiene programs. MB coordinators provided characteristic data. Descriptive statistics of frequencies and percentages were used to identify common characteristics across programs. Pearson Product-Moment Correlation Coefficient, Point Biserial Correlation, and Chi-Square analysis were used to investigate relationships between characteristics and performance outcomes.

**Results.** Thirty-three questionnaires were completed by coordinators for a 73.3% response rate. Common characteristics included MBs as a course requirements, faculty written critiques, and student review sessions. Significant relationships were found between candidate performance outcomes and MB intensity scores, examiner calibration scores, and multiple experiences.

**Conclusion.** This study provided insight to MB characteristics that might assist educators in facilitating experiences to effectively prepare students for these examinations.

## **Chapter 1 Introduction**

### **Introduction**

The purpose of dental hygiene licensure is to protect the health, safety, and welfare of the public. Dental hygiene educational programs, accredited by the Commission on Dental Accreditation (CODA), are relied upon to provide the framework for qualifying undergraduate students to become oral health practitioners. State dental hygiene licensure entities, such as boards, credentialing agencies, and committees, entrust independent third-party examination agencies to ensure that graduating dental hygiene students possess some of the foundational entry-level skills and knowledge necessary for safe and competent practice. WREB is one of these examination agencies.

The CODA, a specialized accrediting agency of the American Dental Association (ADA), is recognized by the United States Department of Education as the only agency to accredit dental, dental hygiene, dental assisting, and dental technician educational programs (ADA, 2013a). Mandated by most state licensing entities, dental hygiene applicants seeking licensure must be graduates from CODA accredited programs. The CODA accredited programs meet standards that are national in scope, and represent the minimum requirements ensuring the quality of dental-related education (ADA, 2013b).

The CODA respects institutional academic freedom and individuality (ADA, 2013b). The accreditation standards encourage educational programming flexibility by allowing schools to determine program objectives, policies, curricula, and evaluation methodologies (ADA, 2013b).

In practice, dental hygienists promote oral health directly to the public through education, prevention, and therapeutic services (American Dental Hygienists' Association [ADHA], 2008). The requirement of graduating from a CODA accredited program signifies one quality standard for dental hygiene licensure. To acquire licensure, dental hygienists must also successfully complete additional quality standards including the written National Dental Hygiene Board Examination and clinical examinations administered by either the licensing state or a third-party regional examination agency depending on individual state statutes. State laws vary in determining dental hygienists' work settings, levels of supervision, and scope of practice. States permitting dental hygienists to perform services, such as administering injectable oral anesthetics and placing restorative materials, might require successful completion of independent third-party examinations specific for that service such as the WREB Local Anesthesia Examination (LAE) and the Restorative Examination (RE).

The WREB is an independent third-party examination agency. In 1975, the concept of a western regional testing agency was discussed in a joint meeting of the American Association of Dental Examiners and the Western Conference of Dental Examiners and Dental School Deans (WREB, 2014c). WREB was formally incorporated in 1976 and in June 1977 it administered the first regional Dental Examination in Oregon (WREB, 2014c). By 1979, WREB was providing Dental Hygiene Examinations (DHEs). Today, WREB has 17 member states, one affiliate member state, and 20 non-member states whose licensing and credentialing agencies utilize WREB examinations to aid in fulfilling state licensure quality standards (WREB, 2014i). In addition to the multiple Dental Examinations and the DHE, WREB also administers separate LAE and RE for

dental hygienists seeking licensure to perform these services in states that require these examinations for licensure. In 2009, WREB began administering the RE to expanded function dental assistants (WREB, 2014c).

WREB examinations identify candidates who meet minimum, entry-level competency standards as determined by the WREB Dental Hygiene Committee (WREB, 2012). The WREB Dental Hygiene Committee is responsible for setting the passing standards (WREB, 2012). The Committee consists of six to seven experienced registered dental hygienists representing the WREB member states with one committee member being an active educator (WREB, 2012). WREB establishes the examination scores in accordance with guidelines put forth in the *Standards for Educational and Psychological Testing* (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education [AERA, APA, NCME], 1999). The *Standards for Educational and Psychological Testing* stated that passing scores must be determined with respect to professional standards of practice (AERA, APA, NCME, 1999). The WREB scores of competency are absolute or criterion-referenced in that they reflect a standard of knowledge and skill acceptable for entry-level performance (AERA, APA, NCME, 1999; WREB, 2012). In other words, candidates who earn a score below the absolute score are not successful and those who earn a score at or above the identified score are successful.

The purpose of the WREB clinical examinations is to evaluate the candidate's clinical competence and ability to utilize professional judgment (WREB, 2014d; WREB, 2014e; WREB, 2014g). Each examination design allows for the candidate to demonstrate his/her aptitude or skill. The examinations draw inferences about the candidate's abilities,

providing a reliable clinical assessment for state licensure entities to use in making valid licensure decisions (WREB, 2014f).

The WREB DHE, LAE, and RE each have clinical testing components. The DHE and LAE also have a written component to evaluate the candidate's knowledge level. The clinical portion of the WREB DHE evaluates the candidate's patient selection; interpretation of patient health status; calculus detection and removal; assessment and documentation of periodontal pocket measurements and gingival recession; and professional judgment (WREB, 2014e). The clinical portion of the LAE consists of the evaluation of the candidate's technique while administering an Inferior Alveolar Nerve block injection and a Posterior Superior Nerve block injection (WREB, 2014d). In 2013, 45 states nationwide permit administration of local anesthesia by dental hygienists (ADHA, 2013b). WREB provides local anesthesia examinations in 10 member states: Alaska, Arizona, California, Idaho, Montana, New Mexico, Oregon, Nevada, Utah, and Washington (WREB, 2014b).

The RE consists of placing, carving, and finishing of one Class II amalgam and one Class II composite restoration on assigned maxillary and mandibular dentoform teeth (WREB, 2013e). Currently, 13 states nationwide permit dental hygienists to place, carve, and finish amalgam and or composite restorations (ADHA, 2010). WREB administers restorative examinations in four states: Alaska, Idaho, Oregon, and Washington (WREB, 2014b).

### **Statement of the Problem**

Third-party examinations, such as the WREB clinical examinations, are intended to evaluate specific criteria differentiating between adequate and inadequate performance

in areas of critical competencies (Crosby, 2006). They are considered high-stakes examinations because the outcome decisions have potentially serious consequences (Chambers, 2011; Hillard, 2002; Kane, 2002; Kohn, 2002; Smith & Fey, 2000). Non-passing earned scores on the WREB DHE, LAE, and RE suggest that dental hygiene students have not attained the skills and knowledge necessary for safe, entry-level performance. As a result, dental hygiene educational programs often use student performance on these third-party examinations to assess the effectiveness of program curricula (Hamerslough, 2008; Ranney et al., 2003; Stewart Bates, & Smith, 2004). However, non-successful attempts on third-party clinical examinations might not be a result of programming curricula or a candidate's clinical ability, but rather a result of student unpreparedness for the examination criteria and environment (Chambers, 2011; Jessee, 2002). Most dental hygiene educational programs administer MB experiences for graduating students (Jessee, 2002). MB experiences are integral to student evaluation and readiness for licensure examinations (Jessee, 2002). As with flexibility in each dental hygiene educational program for differences in objectives, policies, curricula, and evaluation methodologies, there are also differences in MB examination experiences. These differences include testing criteria, evaluator calibration, student remediation, and student self-assessment as well as variation in the number of MB experiences administered by each program (Jessee, 2002). Differences in MB characteristics and criteria intensity levels might relate to licensure examination scores and success rates; however, research on the use of educational MB experiences in entry-level dental hygiene education and the effectiveness specifically to the WREB clinical examinations is limited. If dental hygiene educational programs rely on MB experiences as integral



components of student evaluation and readiness for licensure examinations, then there is a need for current research to determine which characteristics and criteria are critical.

### **Purpose of the Study**

The purpose of this study was to describe the characteristics of the 2013-2014 educational Mock Board experiences for the dental hygiene, local anesthesia, and restorative examinations. The second purpose was to determine if there was a relationship between the intensity of the 2013-2014 educational MB examinations and the dental hygiene programs' average examination scores or success rates for the aforementioned 2014 WREB examinations.

### **Professional Significance of the Study**

The significance of this study was that the results of this research might contribute to the domain of information concerning educational MB characteristics and third-party clinical examinations needed for licensure. Potential benefits might be generated for dental hygiene educators in preparing entry-level dental hygiene students for successful performance on board examinations. If specific characteristics and criteria intensities of these experiences influence the performance scores and success rates with WREB clinical examinations, then an awareness of these factors might assist educators in facilitating MB experiences to more effectively prepare students for these examinations (Hamerslough, 2008; Jessee, 2002). Students who have an understanding of the nuances of the third-party examination experience might incur less stress and therefore, might be less encumbered in demonstrating their clinical competence (Jessee, 2002).

Ensuring that candidates are well equipped with knowledge and possess competent skills for performing clinical procedures is essential for patient safety and for

protecting the integrity of the profession. The professional significance of this study was aligned with national professional organizations' agendas and strategic plans, including those of the American Dental Education Association (ADEA) and the American Dental Hygienists' Association (ADHA).

The ADEA Strategic Directions 2011-2014 begins with the mission statement: "to lead individuals and institutions of the dental education community to address contemporary issues influencing education, research, and the delivery of oral health care for the improvement of the health of the public" (p. 1). By investigating clinical educational methodologies in order to identify variables that influence success rates on the WREB examinations, this study coincided with the ADEA mission statement and is aligned with Strategic Direction 2: Teaching and Learning where the ADEA objective is to "provide dental, allied dental, and advanced dental educators with the information, knowledge, and tools they need to prepare students, residents, and fellows for an undiscovered future" (p. 2); specifically key priority 2-3: "Provide access to high quality curricular tools, templates, and guidance to support effective teaching and learning in the classroom, the clinic, or wherever learning occurs" (p. 2).

The ADHA (2007) National Dental Hygiene Research Agenda, Section C: Professional Education and Development advocates for research on educational methods, curricula, students, and faculty. The results of this investigation on current MB characteristics might help educators develop and facilitate MB experiences that better familiarize students with specific aspects of the clinical examinations, thus, preparing students for successful performance in areas of critical competencies on third-party examinations.

**Research Questions**

- 1) What are the characteristics of educational dental hygiene, local anesthesia, and restorative MB experiences?
- 2) Is there a relationship between MB examination characteristics and dental hygiene clinical board examinations?

**Null Hypotheses**

- 1) There is no statistically significant relationship between educational MB Intensity Scores and WREB performance outcomes on the WREB 2014 DHE, LAE, and RE.
- 2) There is no statistically significant relationship in WREB performance outcomes on the WREB 2014 DHE, LAE, and RE between entry-level dental hygiene programs incorporating examiner calibration prior to MB examinations and entry-level dental hygiene programs not incorporating examiner calibration prior to MB examinations.
- 3) There is no statistically significant relationship in WREB performance outcomes on the WREB 2014 DHE, LAE, and RE between entry-level dental hygiene programs requiring student remediation for each MB experience and entry-level dental hygiene programs not requiring student remediation.
- 4) There is no statistically significant relationship in WREB performance outcomes on the WREB 2014 DHE, LAE, and RE between entry-level dental hygiene programs requiring student self-assessment and entry-level dental hygiene programs not requiring student self-assessment.

- 5) There is no statistically significant relationship in WREB performance outcomes on the WREB 2014 DHE, LAE, and RE between entry-level dental hygiene programs administering one, two, three, or more than three MB experiences.

### **Conceptual Definitions**

For this investigation, the following conceptual definitions were used.

**CODA accredited entry-level dental hygiene program.** CODA accredited programs were dental hygiene programs that prepared graduates for the clinical practice of dental hygiene. Degrees awarded included Certificate, Associate in Arts, Associate of Science, Associate of Applied Science, Bachelor of Science in Dental Hygiene, Bachelor of Science in Health Science, and Bachelor of Science in Allied Health. Entry-level programs that were accredited by CODA required an average of 86 credit hours for an associate degree or 122 credit hours for a baccalaureate degree. Institutional admission and prerequisite requirements vary, but generally included a high school diploma or its equivalent, and up to 40 credit hours of prerequisite college courses (ADHA, 2013a).

**Basic clinical education.** Patient care experiences required for all students to attain clinical competence and to complete the dental hygiene program. This education is provided in the program's clinical facilities (on campus or extended campus facilities) as defined by the *Accreditation Standards* and is supervised and evaluated by program faculty according to predetermined criteria (ADA, 2013b).

**Calibration.** Evaluator comprehensive training to the standardized criteria of the task being examined (Maitland, 2003).

**Class II restorations.** Restorations placed on the proximal surfaces or surfaces between posterior teeth.

**Clinical competencies.** The ability of the student to adequately perform patient care procedures without faculty guidance in preparation for entry-level dental hygiene practice, in accordance with the *Accreditation Standards for Dental Hygiene Education* (ADA, 2013b).

**Competencies.** Written statements describing the levels of knowledge, skills, and values expected of graduates (ADA, 2013b).

**Competence.** The level of knowledge, skills, and values required by new graduates to begin the practice of dental hygiene (ADA, 2013b).

**Dentoform.** An articulated, hinged full dentition replica of the mouth that mounts onto a rod and is fitted onto a dental chair where the patient's head would normally be positioned.

**Educational mock board experience.** An examination designed to simulate the content, format, and grading of the WREB clinical examinations (Hamerslough, 2008). It occurs during the student's education in dental hygiene.

**Educational mock board experience characteristics.** Educational MB characteristics included evaluator calibration, required student remediation, required student self-assessment, post educational MB experience procedures, educational MB experience as part of course evaluation, and variation in the number and timing in the curriculum of MB experiences administered.

**Laboratory or preclinical instruction.** Instruction in which students received supervised experience performing functions using study models, manikins, or other simulation methods; student performance is evaluated by faculty according to predetermined criteria (ADA, 2013b).

**Remediation.** Additional work assigned to correct a deficiency in competencies (Diamond, 2008).

**Standard of care.** Level of clinical performance expected for the safe, effective, and ethical practice of dental hygiene (ADA, 2013b).

**Standardized test.** A test developed to maximize the comparability of scores by providing examinees with the same or parallel content (Salkind, 2008).

**Student self-assessment.** A learning experience completed through specific assessment and qualitative judgment based on student critical self-reflection (Billings & Halstead, 2009).

### **Operational Definitions**

**DHE Intensity Scores.** Scores for the MB DHE experiences were classified by the use of categories based on the 2014 WREB DHE criteria and procedures as follows: preliminary criteria, equipment and materials, performance grading criteria, examination procedure criteria, radiographic criteria, patient oral criteria, and general patient criteria (WREB, 2014e). Each category had 5-15 items associated with the criteria and procedures (see Table 1 for an overview; Appendix A contains the questionnaire and more detail on the content). One point was given to each item of the seven categories if the educational MB examination followed the criteria and procedures established by WREB. No points were awarded if the MB item was not followed. The Intensity Score, represented as a percentage, was computed by summing the total number of points divided by the total number of questions. The total number of category items was 71 (see Table 1). The DHE Intensity Score reflected the percentage of WREB criteria to which the educational MB experience adhered.

Table 1.

*DHE Examination Criteria Intensity Scoring*

<b>Item Category</b>	<b>Total # of Items</b>
Preliminary Criteria	5
Equipment and Materials	5
General Patient Criteria	15
Patient Oral Criteria	9
Radiographic Criteria	9
MB procedure Criteria	15
MB Performance Grading Evaluation	14
Total	72

**DHE examiner calibration scores.** Examiner calibration was based on the following items being calibrated prior to the MB examination experience (1) patient check-in procedure/criteria, (2) patient check-out procedure/criteria, (3) conducted on dentoforms, and (4) conducted using the WREB required instruments. The DHE examiner calibration scores were a percentage, computed by how many of the four items were included in the MB for each entry-level program. The number of “Yes” responses was divided by four to compute a percentage score for each program.

**DHE post MB procedures.** Post MB procedures included (1) a written critique of student performance, (2) class review sessions, (3) individual student review sessions, (4) review sessions with nonpassing students only, (5) MB completion until passing score is met, and (5) remediation. The DHE post MB procedures scores were a percentage, computed by how many of the items were included by the entry-level program. The

number of “Yes” responses was divided by the total number of items to compute a percentage score for each program.

**DHE student self-assessment scores.** Student self-assessment scores were based on the following items (1) student self-assessment on the MB experience prior to receiving examination results (e.g. patient selection, preparation, time allocation, etc.), (2) student self-assessment on his/her performance on the MB (e.g. success with calculus deposit removal, periodontal assessment, etc.) prior to receiving examination results, and (3) student self-assessment based on the MB experience and/or performance in writing, orally, or both. The DHE student self-assessment scores were a percentage, computed by how many of the three items were included in the MB for each entry-level program. The number of “Yes” responses was divided by three to compute a percentage score for each program.

**DHE number of educational mock board experiences.** The number of educational MB experiences was categorized as one, two, three, or more during the dental hygiene curriculum.

**DHE WREB performance outcome.** The DHE WREB performance outcome is represented by the following two variables: candidate Total Points and candidate Pass/Fail outcome. Total Points is the final number of points earned by each candidate, which reflected point scales that were scaled from 0 to 100 points, such that 75 was the passing cut score. The Pass/Fail variable indicated whether the candidate passed or failed the examination attempt.

**LAE Intensity Scores.** Scores for the MB LAE experiences were classified by the use of categories based on the 2014 WREB LAE criteria and procedures as follows:



preliminary criteria, equipment and materials, performance grading criteria, examination procedure criteria, and general patient criteria (WREB, 2014d). Each category had 4-28 items associated with the criteria and procedures (see Table 2 for an overview; Appendix B contains the questionnaire and more detail on the content). One point was given to each item of the five categories if the educational MB examination followed the criteria and procedures established by WREB. No points were awarded if the MB item was not followed. The Intensity Score, represented as a percentage, was computed by summing the total number of points divided by the total number of questions. The total number of category items was 81 (see Table 2). The LAE Intensity Score reflected the percentage of WREB criteria to which the educational MB experience adhered.

Table 2.

*LAE Examination Criteria Intensity Scoring*

Item Category	Total # of Items
Preliminary Criteria	6
Equipment and Materials	4
General Patient Criteria	17
MB procedure Criteria	26
MB Performance Grading Evaluation	28
Total	81

**LAE examiner calibration scores.** Examiner calibration was based on the following items (1) conducted using the candidate clinical preparation procedure/criteria, (2) conducted using the WREB local anesthesia administration procedure/criteria, (3) conducted using the WREB Critical Aspects of injection, (4) conducted using the WREB

Less Critical Aspects of injection, (5) conducted in a clinical setting with a patients, and (6) conducted using the WREB required instruments. The LAE examiner calibration scores were a percentage, computed by how many of the six items were included in the MB for each entry-level program. The number of “Yes” responses was divided by six to compute a percentage score for each program.

**LAE post MB procedures.** Post MB procedures included (1) a written critique of student performance, (2) class review sessions, (3) individual student review sessions, (4) review sessions with nonpassing students only, (5) MB completion until passing score is met, and (5) remediation. The LAE post MB procedures scores were a percentage, computed by how many of the items were included by the entry-level program. The number of “Yes” responses was divided by the total number of items to compute a percentage score for each program.

**LAE student self-assessment scores.** Student self-assessment scores were based on the following items (1) student self-assessment on the MB experience prior to receiving examination results (e.g. patient selection, preparation, time allocation, etc.), (2) student self-assessment on his/her performance on the MB (e.g. patient management, injection technique, such as penetration site, injection rate, and deposit rate, etc.) prior to receiving examination results, and (3) student self-assessment based on the MB experience and/or performance in writing, orally, or both. The LAE student self-assessment scores were a percentage, computed by how many of the three items were included in the Mock Board for each entry-level program. The number of “Yes” responses was divided by three to compute a percentage score for each program.

**LAE number of educational mock board experiences.** The number of educational MB experiences was categorized as one, two, three, or more during the local anesthesia curriculum.

**LAE WREB performance outcome.** The LAE WREB performance outcome is represented by the candidate Pass/Fail outcome. The Pass/Fail variable indicated whether the candidate passed or failed the examination attempt.

**RE Intensity Scores.** Scores for the MB RE experiences were classified by the use of categories based on the 2014 WREB RE criteria and procedures as follows: preliminary criteria, equipment and materials, performance grading criteria, examination procedure criteria, dentoform criteria, and preparation criteria (WREB, 2014g). Each category had 5-27 items associated with the criteria and procedures (see Table 3 for an overview; Appendix C contains the questionnaire and more detail on the content). One point was given to each item of the six categories if the educational MB examination followed the criteria and procedures established by WREB. No points were awarded if the MB item was not followed. The Intensity Score, represented as a percentage, was computed by summing the total number of points divided by the total number of questions. The total number of category items is 92 (see Table 3). The RE Intensity Score reflected the percentage of WREB criteria to which the educational Mock Board experience adhered.

Table 3.

*RE Examination Criteria Intensity Scoring*

Item Category	Total # of Items
Preliminary Criteria	5
Equipment and Materials	7
Dentoform Criteria	7
Prep Criteria	6
MB procedure Criteria	27
MB Performance Grading Evaluation	15
Total	67

**RE examiner calibration scores.** Examiner calibration was based on the following items (1) check-in procedure/criteria prior, (2) conducted using the WREB grading criteria, (3) conducted using the WREB required dentoforms and restorations placed in WREB required tooth preparations, (4) conducted using the WREB required restorative materials, and (5) conducted using the WREB required instruments. The RE examiner calibration scores were a percentage, computed by how many of the five items were included in the Mock Board for each entry-level program. The number of “Yes” responses was divided by five to compute a percentage score for each program.

**RE post MB procedures.** Post MB procedures included (1) a written critique of student performance, (2) class review sessions, (3) individual student review sessions, (4) review sessions with nonpassing students only, (5) MB completion until passing score is met, and (5) remediation. The RE post MB procedures scores were a percentage, computed by how many of the items were included by the entry-level program. The

number of “Yes” responses was divided by the total number of items to compute a percentage score for each program.

**RE student self-assessment scores.** Student self-assessment scores were based on the following items (1) student self-assessment on the MB experience prior to receiving examination results (e.g. preparation selection, composite selection, time allocation, etc.), (2) student self-assessment on his/her performance on the MB (e.g. Class II amalgam and composite restoration placement procedures) prior to receiving examination results, and (3) student self-assessment based on the MB experience and/or performance in writing, orally, or both. The RE student self-assessment scores were a percentage, computed by how many of the three items were included in the Mock Board for each entry-level program. The number of “Yes” responses was divided by three to compute a percentage score for each program.

**RE number of educational mock board experiences.** The number of educational MB experiences was categorized as one, two, three, or more during the restorative curriculum.

**RE WREB performance outcomes.** The RE WREB performance outcome is represented by the following two variables: candidate Total Points and candidate Pass/Fail outcome. Total Points is the final number of points earned by each candidate, which reflected point scales that were scaled from 0 to 100 points, such that 75 was the passing cut score. The Pass/Fail variable indicated whether the candidate passed or failed the examination attempt.

## **Chapter 1 Summary**

For licensure, dental hygienists must accomplish multiple quality standard requirements such as graduation from a CODA accredited entry-level dental hygiene program and successful completion of both the written National Dental Hygiene Board Examination and clinical examinations administered by either the licensing state or a third-party regional examination agency. The WREB is an independent third-party examination agency whose examinations identify dental hygiene candidates who meet minimum, entry-level competency standards by evaluating the candidate's clinical competence and ability to utilize professional judgment (WREB, 2014d; WREB, 2014e; WREB, 2014g).

Third-party examinations, such as the WREB clinical examinations, are considered high-stakes examinations because the outcome decisions have potentially serious consequences (Chambers, 2011; Hillard, 2002; Kane, 2002; Kohn, 2002; Smith & Fey, 2000). As a result, most dental hygiene educational programs administer MB experiences for graduating students in order to prepare the students for the examination criteria and environment (Jessee, 2002). However, differences by each program in testing criteria, evaluator calibration, program response to student performance, and student self-assessments as well as variation in the number of MB experiences might influence licensure examination outcomes. If specific characteristics and examination criteria intensities influence the performance scores and success rates with WREB clinical examinations, then an awareness of these factors might assist educators in facilitating MB experiences to more effectively prepare students for these examinations (Hamerslough, 2008; Jesse, 2002). Research on the use of educational MB experiences in entry-level

dental hygiene education and their effectiveness specifically to the WREB clinical examinations is limited. The research results of this study might contribute to the domain of information concerning educational MB characteristics and the intensity of the examination experience to the success of candidates who complete third-party clinical examinations necessary for licensure.

## **Chapter 2 Review of the Literature**

### **Introduction**

Current research on the issues of dental third party examinations necessary for licensure focuses on the validity of evaluating a graduate's ability for independent practice. Few researchers have investigated identifiers predicting examination success and fewer have investigated identifiers predicting success through the use of educational MB experiences. Research on the use of educational MB experiences in entry-level dental hygiene education and the effectiveness to licensure examinations is limited and dated. There are no studies investigating the effectiveness of educational MB experiences specifically to the WREB LAE and RE.

This review of literature will examine current research that evaluated clinical education, third-party licensure examinations, and educational MB experiences as an influence on initial licensure examinations. Initially, this review tried to limit the search years to ten; however, due to the limited amount of research available, the search was expanded to 20 years and depending on the topic, expanded to 31 years. The primary search engines used were Academic Search Premier, EBSCOhost, Medline, ProQuest, and PubMed. Examples of MeSH terms include: accreditation, clinical assessment/evaluation, clinical competence/standards, competency-based education/standards, dental hygiene/education/faculty/development, dental hygiene licensure examinations, education/dental/dental hygiene/standards, educational measurements/methods/standards, performance assessment, predictive value of tests, psychomotor skills/ practice-based assessment/skill acquisition, and standardized clinical examinations/professional licensure.



## **Clinical Education**

Effective teaching and learning in the clinical learning environment is critical for preparing students to provide safe and competent patient care (Billings & Halstead, 2009). During the clinical curriculum, students apply the principles and concepts learned in the classroom and gain experiences otherwise not available in didactic learning environments. The difficulty for educators lies in determining the appropriate assessment techniques for evaluating student ability as well as advancing students toward entry-level performance and into independent patient care (Billings & Halstead, 2009). Developing clinical skills is a cognitive, affective, and psychomotor progression through multiple learning levels (Hauser & Bowen, 2009).

**Stages of learning in dental education.** Benner's (1982) learning levels of skill development in nursing has become an educational standard in oral health fields. Brenner's (1982) levels of novice, advanced beginner, competent, proficient, and expert characterizes the progression of clinical knowledge development based upon education and experience. The lowest level, novice, Benner (1982) described as the learner has having little or no knowledge and is taught in terms of objective attributes through rules and guidelines. In the next level, the advanced beginner is able to demonstrate marginally acceptable performance under the guidance of a mentor or instructor (Benner, 1982). The learner at this level, Benner explained (1982), is still memorizing guidelines and rules and does not fully understand concepts. In the third level, competent, the practitioner is now able to develop perspectives based on conscious, abstract, and analytical contemplation (Benner, 1982). Benner (1982) believed it is at this level that standardization and routine practice reinforces the learner's clinical abilities. At the proficient level, the practitioner is able to perceive situations as whole rather than

individual aspects and can grasp the overall picture (Benner, 1982). Benner (1982) believed this level is best taught through the use of case studies rather than tests. The highest level, expert, Benner (1982) described practitioners as having a deep understanding of the situation and their clinical skills are exceptional.

Chambers (2004b) discussed educational and evaluation methods appropriate for each level of learning as it relates to dentistry. At the novice level, dental students are taught through lecturing and faculty controlled laboratories. According to Chambers (2004b), standardized testing is the evaluation method of choice for a student in this stage because the situations are uniform and regulated. Educational methods for the next level, beginner include seminars and continued supervision in laboratory settings (Chambers, 2004b). Chambers (2004b) suggested simulation evaluation methods, such as cases and dentoform exercises are ideal for the beginner stage of learning because they provide realistic situations allowing the dental student some degree of responsibility. When students pass simulation evaluations, they are ready to begin treating patients under supervision. In the third stage, Chambers (2004b) asserted that competency only can be taught in realistic settings and assessed through authentic evaluation. Authentic evaluation is a portfolio of experiences during the clinical curriculum that includes test cases, faculty ratings, or professional judgments of a dental student's performance, and work samples, such as charts, records of completed cases, and audits of infection control (Chambers, 2004b). Authentic evaluation qualifies students to become independent practitioners by combining understanding, skills, and values (Chambers, 2004b). According to Chambers (2004b), it is during independent practice that a dentist advances to the higher stages of proficiency and mastery through continuous professional growth

after graduation. From novice to mastery or expert, Chamber (2004b) estimates the growth process takes 10 to 15 years.

***Psychomotor skill learning in dental education.*** Psychomotor skills are those skills that require mental and muscular symmetry in order to perform or accomplish a desired task (De Andrés, Sánchez, Hidalgo, & Díaz, 2004). They are achieved through progressive attainment requiring standardized and routine practice (Benner, 1982). The development of optimal psychomotor skills is a critical educational objective for dental and dental hygiene's clinical scope of patient care.

The clinical skill sets associated with dentistry are considered fine psychomotor skills because the tasks are precision-oriented (De Andrés et al., 2004). In the progression of learning precision-oriented skills, students first achieve simple movements, then gain greater movement efficiency, develop more complex control strategies, and finally develop skill expertise (Sizer, 2002). For both novice and beginner level learners there will be differences in innate capacities and their learning needs will not be equal (De Andrés et al., 2004). However, through periods of deliberate practice with specific feedback, learners can advance toward becoming competent (Chambers, 2012; Suksudaj, Townsend, Kaidonis, Lekkas, & Winning, 2012). Specific feedback can be provided in a variety of evaluation methods, such as laboratory practica, completion of specified procedures, daily grades, rubrics, rating systems, and non-graded assessments (Albino et al., 2008; De Andrés et al., 2004; Hauser & Bowen, 2009). To determine if the competent level of learning has been attained, the performance evaluation methods need to measure the learner's psychomotor skills in a real-world setting (Albino, et al.,

2008; Chambers, 2004b; Krammer et al., 2009; Navickis et al., 2010). This type of evaluation is a fundamental element of competency-based education.

**Competency-based education.** Competencies are “safe beginner standards” that create the “framework for learning experiences and the focus for student assessment” (Plasschaert et al., 2002, p. 33). Competency-based education measures a learner’s ability to perform tasks against real-life work standards (Albino, et al., 2008; Chambers, 2004b; Krammer et al., 2009; Navickis et al., 2010). In research assessing students’ competence, Albino, et al. (2008) summarized competency-based education characteristics that differentiated it from other educational methodologies: (1) outcomes are based on job responsibilities and tasks, (2) curriculum is directed toward what the student needs to learn to execute these responsibilities and tasks, (3) curriculum is arranged hierarchically, and (4) assessments measure unassisted performance in mock real-world settings. Competency-based education is a cornerstone in dental education. It is the accepted standard influencing curriculum, clinical education and assessment, and accreditation (Lacari & Chambers, 2007).

In early to mid 1990s, CODA began including competencies as an expectation in their *Accreditation Standards for Dental Education*. The latest revised edition, 2013, states that for accreditation, each school is expected to develop specific competency assessment methods that reflect evidence-based general dentistry (ADA, 2013a). Both the *CODA Accreditation Standards for Dental Education Programs* and *Accreditation Standards for Dental Hygiene Education Programs* defined competencies as “written statements describing the levels of knowledge, skills and values expected of graduates” and competent as “the levels of knowledge, skills and values required by the new

graduates to begin independent, unsupervised dental [dental hygiene] practice” (ADA, 2013a, p. 16; ADA, 2013b, p. 9).

As a result of CODA accreditation standard requirements, competency-based curricula have been woven into dental and dental hygiene education. However, there is variation in competency interpretation and accreditation requirement implementation. Licari and Chambers (2007) conducted a study to determine United States and Canadian dental school academic and clinical deans’ and department chairs’ understanding of competency and its application and effects in dental education. Licari and Chambers (2007) found less than half the participants recognized the accepted definition of competency and discovered differences in competency-based education application and impact across schools and respondents. While some respondents felt competency-based curricula stimulated innovation and improved the quality of graduates, others responded with frustration indicating no changes in student improvement. The Licari and Chambers’ 2007 study also revealed discrepancies in evaluation and assessment denotation. In some schools, the term “competency” was referred to as a name for clinical test cases rather than evaluation of skills, knowledge, and values signifying readiness for independent practice. The perceived ambiguity of defining competency and differences in competency-based clinical education application are issues that can affect educational assessment reliability.

**Competency assessment reliability.** Variations in competency interpretation and accreditation requirement implementation are just some issues influencing assessment reliability. Other issues include intra and inter clinical faculty differences. A 2008 summary of literature dating back to the 1960s reviewed studies that addressed reliability

aspects of the various methods of student assessment (Albino et al., 2008). The review was conducted by a task force of the ADEA's Commission on Change and Innovation in Dental Education on student outcomes assessment and part of a larger study to make recommendations that would optimize strategies to measure and evaluate performance. Prevalent themes found in the task force's review were faculty agreement and alignment or calibration, and evaluator consistency.

Critical to a student's learning experience is faculty who possesses content knowledge, didactic and clinical teaching expertise, sensitivity, and commitment (Billings & Halstead, 2009; Hand, 2006). However, evaluator inconsistencies and differences in background, knowledge, and opinions might compromise the ability to reliably assess teaching effectiveness and student learning. Intra and inter-evaluator variation and its effect on assessment reliability are common themes when examining student assessment. For example, in a 2009 study, Park, Susarla, and Karimbux found differences in clinical grading by instructor status within one dental school. For restorative procedures, the authors discovered the part-time faculty graded more harshly than full-time faculty or graduate residents. Park et al., (2009) suggested a possible reason for the grading differences could have been caused by differences between instructor calibration requirement sessions for each status level. A study on variability in periodontal diagnosing and treatment planning among clinical instructors by Lanning et al. (2005) is another example of evaluator variation affecting assessment reliability. Lanning et al., (2005) found significant evaluator variation among clinical instructors at various dental schools. One reason, the authors suggested, was due to faculty diagnostic variation and unfamiliarity with the use of accepted criteria. However, Lanning et al.,

(2005) cautioned that the lack of consistency also might be due to the subjective nature of diagnosing and treating periodontal disease.

A literature review pertaining to evaluator reliability and consistency produced multiple studies discussing strategies to improve evaluator calibration such as designing valid criteria, rating systems, and training programs. In one such study, Taleghani, Solomen, and Wathen (2004) reported diminished intra and inter-evaluator discrepancies at Baylor School of Dentistry when traditional numerical grading systems were replaced with non-graded performance assessments. Baylor's traditional clinical grading evaluation consisted of a block 0-4 grading system that was "subjective, difficult to calibrate, susceptible to individual faculty personalities, and offered insufficient teaching opportunities and discussion time with students" (Taleghani, Solomen, & Wathen, 2004, p. 646). The new non-graded clinical evaluation system, according to Taleghani et al. (2004), implemented a mentor-to-student learning environment and directed evaluation by using a two-form competency assessment document. The assessment documents were developed through identified professional standards of competency criteria and faculty input (Taleghani et al., 2004). The two-form assessment objectively outlined and defined specific dental care categories such as behavioral or nontechnical aspects of dentistry and clinical or technical procedures. For example, the first form defined behavioral aspects into categories such as professionalism and patient management (Taleghani et al., 2004). Before the documents were implemented, faculty participated in workshops calibrating to the defined aspects on the assessment forms. As the clinical procedures were performed by the students, the calibrated faculty evaluated the nontechnical and technical aspects of the procedure according to the competency assessment documents (Taleghani et al.,

2004). Taleghani et al. (2004) reported that the results of these changes produced strong positive responses from both students and faculty.

In another study investigating strategies to improve evaluator consistency, Haj-Ali and Feil (2005), studied evaluator reliability using calibration training and tests where faculty independently evaluated prepared teeth over a ten week period of time. Although some of Haj-Ali and Feil (2005) data analysis showed inconsistencies and disagreement between evaluators, the authors ultimately concluded that with calibration, evaluators can improve consistency and agreement and that these improvements are stable over time. One study that did not find statistical improvement in evaluator consistency through calibration was by Garland and Newell (2009). The purpose of Garland and Newell's 2009 study was to investigate the effectiveness of faculty calculus detection calibration training on intra and inter-evaluator consistency. Twelve dental hygiene faculty members with varying degrees of experience at the University of Minnesota School of Dentistry were divided into two groups; an experimental group who received calibration training and a control group who did not receive training. Both groups were given two pre-tests and two post-tests on three dentoforms with varying amounts and sizes of simulated calculus deposits on the teeth (Garland & Newell, 2009). The faculty participants were to respond with a yes if they detected calculus by feeling each tooth with an 11/12 explorer. In between the pre and post-tests, the experimental group participated in three 2 hour calibration training sessions. The training sessions consisted of discussion, demonstration, and hands-on practice of specific exploring sequencing for detecting calculus deposits (Garland & Newell, 2009). The data analysis found no statistically significant intra or inter-evaluator consistency increase with calibration training. Garland



and Newell (2009) believed the results were affected by limitations in the study such as the poor simulation of the dentofrom gingiva and tooth anatomy. The authors reported that the participants felt the dentofroms were not authentically adequate to realistically detect calculus deposits. Despite the results, Garland and Newell (2009) contend that calibration improves consistency which is necessary to enhance student learning.

**Summary.** Developing clinical skills is a progression through multiple learning levels. To appropriately evaluate at each of the different learning levels, effective assessment and evaluation methods need to be explicit in their criteria, use a standardized format, and provide specific immediate feedback (Hauser & Bowen, 2009). Evaluation methods range from simple written formats to performance demonstrations of skill in realistic settings, assessing students' progression toward and attainment of the learning level of competent (Krammer et al., 2009).

Although there is interpretation ambiguity in the CODA definition of competency and variations in accreditation requirement implementation, clinical competency assessments are a mainstay in determining new graduates' readiness for safe practice. By imitating realistic settings, competency assessments test through authentic evaluation (Chambers, 2004b). Clinical competency assessments are often structured and evaluated under similar circumstances to licensing examinations (Jessee, 2002).

### **Clinical Licensure Examinations**

Only state dental and dental hygiene boards have the authority to grant dental and dental hygiene licensure. State licensure entities entrust independent third-party examination agencies to ensure that the graduating dental and dental hygiene students possess foundational entry-level skills and knowledge necessary for safe and competent practice. "Graduates of accredited dental education programs should not be granted

licenses automatically” (Chambers, 2004b, p. 174). Due to intra and inter-educational program variance in CODA competency interpretation as well as other factors such as variety in the quality of teaching and teaching methodology and instructor calibration, the educational process alone cannot certify that a graduate is competent (Chambers, 2004b; Licari and Chambers, 2007; Maitland, 2003). Because third-party examinations are independent from educational institutions, educational accrediting bodies, or professional organizations, they are able to objectively determine if a graduate is safe for patient care (Maitland, 2003). These independent examinations measure to the standard level of minimally acceptable skills, which is not to be confused with the advanced learning levels of proficient or mastery (Cosby, 2006; Plasschaert et al., 2002).

Just as with any test, clinical licensure examinations are a sample of tasks in the larger domain of dentistry. They are intended to evaluate specific criteria differentiating between adequate and inadequate performance in areas of critical competencies (Crosby, 2006). Through content validity, they draw inferences about the candidate’s readiness to practice independently by assessing the candidate’s current skills.

**Validity.** “Validity is the quality of an instrument to yield inferences about the trait it measures” (Smith & Fey, 2000, p. 336). The 1999 *Standards for Educational and Psychological Testing* defines validity as “.....the degree to which evidence and theory support the interpretation of test scores entailed by proposed uses of tests.... The process of validation involves accumulating evidence to provide a sound scientific bases for the proposed score interpretations” (AERA, APA, & NCME, 1999, p. 9).

Third-party licensure examinations, such as the WREB clinical examinations, are criterion-based. In the criterion-based model, validation requires a criterion or benchmark

measure that provides a real or an approximation of a real value (Kane, 2001). If the criterion is well-defined and demonstrable, validity could be evaluated in terms of how well test scores predict criterion scores (Kane, 2001). Criterion validity provides evidence of a candidate's competence on specific abilities critical for practice (Kane, 1982). Standardized initial licensure examination validity can be interpreted two ways: (1) as a prediction for a provider's future performance, or (2) as evidence of a candidate's present competence on specific abilities (Kane 1982). The second interpretation is more appropriate for clinical licensure examinations (Kane, 1982). It suggests the use of content validity, rather than predictive validity, which measures critical abilities by empirical analysis of the domain set of skills (Kane, 1982).

The WREB DHE, LAE, and RE are standardized tests with specific criteria to draw inferences about candidates' readiness to practice (WREB, 2014d, WREB, 2014e, WREB, 2014g). The WREB clinical examinations measure through criterion validity. They use cut-score based assessments that are determined by professional performance standards (WREB, 2012). Cut-scores are numerical values assigned to raw-score performance levels. The raw-score that represents entry-level competence standards on a WREB clinical examination is three on a scale of zero through five. The average performance of three, assuming no penalties, would result in a re-scaling to 75. Higher than three would be a score over 75 and lower than three would be a final score lower than 75. WREB uses 75 as the cut-score to establish pass/fail categories for candidates taking their examinations (WREB, 2012).

**Variability.** Intrinsic variables emerge from the candidate. They include student's lack of clinical skills, inability to visualize end product, inability to self-assess, lack of

knowledge or experience on a licensure exam, poor time management, and test anxiety and/or fear (Chambers, Dugoni, & Paisley, 2004; Kohn, 2000). Extrinsic variables, such as equipment, materials, evaluator reliability, and patients, are influences outside the candidate's control (Chambers, Dugoni, & Paisley, 2004) and are more often the subject of controversy.

**Controversies.** Standardized tests are a source for criticism. Opponents to standardized tests, especially high-stakes tests such as licensure examinations, debate that the tests only measure a narrow range of knowledge and a low level of thinking and some question if the tests measure anything of value (Chambers, 2011; Hillard, 2000). The common belief is that the tests fail to assess achieved skills and knowledge and in some cases underestimate the abilities of talented students (Kohn, 2000). In a review of literature pertaining to arguments that specifically question the validity of standardized third-party licensure examinations, three arguments prominently emerge: (1) the nature of a one-shot assessment, (2) examination unfairness from examiner bias and scoring irregularities, and (3) patient variability and unethical patient treatment.

***One-shot examination approach.*** In discussing the inappropriateness of high-stake standardized tests, Hillard (2000) argued that the lack of validity was due to the test criterion not ubiquitously aligning with curricula. Due to differences in educational materials, variety in the quality of teaching and teaching methodology, and instructional goals and content, Hillard (2000) stated that one standardized test alone would not be appropriate or relevant. Although the reasoning against high-stake standardized tests differs in dentistry, the conclusion is the same. One examination is not a valid assessment method to grant licensure (Chambers, 2004b; Chambers 2011; Chambers, Dugoni, &

Paisley, 2004; Donalson et al., 2008; Gadbury-Amyot et al., 2005; Patrick, 2001; Ranney, Gunsolley, & Wood 2003).

There were many discussions against one examination as being a valid assessment method to aid in granting initial licensure. One argument is that the examinations measure at a beginner level and do not measure to the level of competent (Chambers, 2004b). Another argument is that the examinations are not representative of a candidate's true competency (Chambers, 2011). Gadbury-Amyot et al. (2005), in a study exploring the validity of licensure examinations, concluded the one-shot examination method to be inappropriate for determining competency because it does not allow the candidates to engage in meaningful self-assessment and it cannot determine the candidate's competency in multiple experiences across different contexts. Patrick (2001) found, in a Delphi study of dental hygiene program directors, general agreement among the directors that competency is determined over a continuum of time and not in a single examination.

An additional discussion against the one-shot approach is that one examination is considered to be a too small of a work sample to justify a confident assessment of a candidate's ability (Chambers, 2011). Proponents for this argument cite as justification the inconsistent correlation between the high-stakes examinations and other performance evaluators such as grade point average (GPA) and class ranking.

While exploring the effect of globalization on dental education, Donalson et al. (2008) concluded third-party licensure examinations fail to establish agreement between examination results and other measures of competency such as national board examinations, GPA, class ranking, and overall performance in school. A suggested more valid method in providing estimates of ability for making high-stakes decisions is to use

multiple performance samples such as test cases, faculty ratings, or professional judgments of a dental student's performance (Chambers, 2004b, 2011).

The controversy of one-shot standardized examinations not representing a candidate's true competency regards validity as a characteristic of the test rather than the test's context and use (Smith & Fey, 2000). These arguments assume predictive validity that measures an estimation of a candidate's future performance rather than measuring evidence of their present ability (Kane, 1982). The purpose of third-party licensure examinations is to evaluate specific criteria differentiating between adequate and inadequate performance in areas of critical competencies (Crosby, 2006). They are intended to determine a candidate's readiness to practice by assessing if the candidate possesses entry-level knowledge and skills suitable to begin safe practice.

***Examiner consistency.*** Extrinsic variables concerning the subjective nature and inconsistency of examiners are controversies that question the validity of third-party licensure examinations. Examiner opinion pertaining to individual candidates might account for unintentional bias (Hamerslough, 2008). However, regional testing agencies practice blind objectivity where examiner bias about candidates has been removed by removing all identifying characteristics of the candidate negating the issue of unintentional bias (Chambers, Dugoni, & Paisley, 2004). The WREB DHE and RE are conducted anonymously (WREB, 2014f). Candidate names and educational program identifiers do not appear on examination materials, only patient first names and candidate pre-assigned identification numbers appear on forms that are viewed by the examiners (WREB, 2014f). The WREB LAE is not an anonymous examination (WREB, 2014f).

Irregularities in examiner scoring causing inadvertent error are another controversy concerning examiner consistency. Debate supporting this controversy includes the lack of uniform standard testing to measure examiner competency (Patrick, 2001) as well as the lack of examiner consistency in measuring candidate performance (Chambers, 2011). These arguments might have been issues in the past. Examiner consistency is unlikely to account for random variation because testing agencies place emphasis on calibration (Chambers, 2011). Examiners are required to undergo comprehensive and continued training to the tasks they are examining, and are tested on their ability to calibrate to standardized criteria (Maitland, 2003). Also, using multiple examiners corrects for the relatively small amount of examiner error (Chambers, 2004b).

The WREB places emphasis on examiner standardization and calibration. Prior to each examination, examiners are mailed and required to read the Examiner Manual, Policy Guide, and Candidate Guide (WREB, 2014h). The examiners also are required to participate in online standardization presentations and exercises (WREB, 2014h). The DHE standardization includes instructions and criteria standardization for patient acceptance, pre-clinical oral conditions, clinical oral assessments, gingival and non-gingival tissue trauma, and radiographic acceptance and technique evaluation (WREB, 2014h). A radiographic calibration test also is provided after the online radiographic standardization is completed. The LAE standardization includes instructions and standardization criteria for patient acceptance, grading, and local anesthesia PSA and IA injections (WREB, 2014h). The RE includes instructions, amalgam and composite criteria, and exercise worksheets (WREB, 2014h). One day prior to the examination at the examination testing site, examiners are required to participate in Examiner

Calibration Workshops where they apply the evaluation techniques and criteria learned and practiced during standardization. The calibration exercises are constructed with passing standards that must be successfully met by examiners (WREB, 2014h). The passing standards provide statistical data to document examiner training and ensure validity of the examinations (WREB, 2014h). All standardization and calibration criteria are based on entry-level performance that are determined by the WREB Local Anesthesia, Restorative and Dental Hygiene Committees and approved by the Dental Hygiene Exam Review Board (WREB, 2014h).

***Human subjects.*** Possibly the most discussed controversy; the issue of using human subjects encompasses a full scope of arguments from the impossibility of standardizing patients to several ethical issues, and even to unavoidable candidate dysfunctional stress (Gadbury-Amyot et al., 2005; Hasegawa, 2001; Stewart, Bates, & Smith, 2005). Formicola, Shub, and Murphy (2002), in discussing the use of patients as test subjects for licensure examinations, summarized why this practice is antiquated. First, using live patients only tests a narrow range of skills which does not reflect the complexity of dentistry. Second, using live patients for a performance evaluation is not in the best interest of the patient nor does it take into consideration the patient's needs, desires, and values. Formicola et al., (2002) argued that this practice violates the professional code of ethics because it provides a morally and legally minimum standard of care. Lastly, as a result of the impossibility to standardize human beings as test subjects, each patient creates a different clinical situation. Therefore, Formicola et al., (2002) stated, each candidate essentially takes a different exam.



Patient variability is also an argument for continuing the use of live patients for licensure examinations. The variances in examination patients represent the variances in real world practice (Pattalochi, 2002). Competency evaluations should represent realistic settings and only authentic competencies are demonstrated on live patients (Chambers, 2004b). Patient-based evaluation incorporates essential dental and dental hygiene skill assessments unique to patient care such as patient health evaluation, moisture control, soft tissue and periodontal management, and pain control (Pattalochi, 2002).

The WREB DHE and LAE use live patients. They each incorporate specific patient criteria and criteria for oral conditions as well as examination procedures to reduce extrinsic variability. The WREB RE does not use live patients. Instead, the examination requires specific dentoform and tooth preparation criteria which further reduce extrinsic variability. Chambers (2004b) believed simulation evaluation methods are appropriate learning and evaluation tools during initial stages of clinical experiences and are not valid for testing competency. However, Chambers (2004b) affirms simulation evaluation methods provide realistic situations that demonstrate the student's ability to begin treating patients under supervision. The purpose of the WREB RE is to determine if the candidate possesses entry-level knowledge and skill sets suitable for placement of restorative materials under direct supervised settings as mandated by state statutes (WREB, 2014g).

**Summary.** There are many reasons candidates are unsuccessful on third-party licensure examinations. As a result there are also many controversies debating why these examinations are invalid. However, the unsuccessful attempts that illustrate the importance of independent evaluation are those where the candidate demonstrates gross

incompetence that are not just mistakes, but evidence of critical ability deficit (Maitland, 2003). Independent third-party licensure examinations are not intended to predict a candidate's future performance as an independent practitioner. By evaluating specific criteria differentiating between adequate and inadequate performance in areas of critical competencies, third-party licensure examinations are intended to assess if a candidate possesses entry-level knowledge and skills necessary for safe and competent practice (Crosby, 2006).

### **Educational Mock Board Experiences**

Third-party initial licensure examinations are considered high-stakes tests because the outcome decisions have potentially serious consequences (Hillard, 2002; Kane, 2002; Kohn, 2002; Smith & Fey, 2000). Dental and dental hygiene candidates must pass these examinations in order to be granted licensure to practice. As a result of the magnitude of these examinations, high-stake test scores are interpreted to make policy assumptions about content and performance standards that should be applied to the programs and students (Kane, 2002). Although not the intended purpose, dental and dental hygiene schools often use student performance on these tests for assessing the effectiveness of their program curricula (Hamerslough, 2008; Ranney et al., 2003; Stewart Bates, & Smith, 2004). However, few studies have investigated variables that might influence performance on initial licensure examinations. This situation could be partly due to the difficulty in achieving adequate statistical power for meaningful results (Stewart et al., 2004). For the purpose of this study, the literature review is limited to educational MB experiences.

Practicing procedures in a format similar to an initial licensure examination should have a positive influence on the examination outcome because this process

introduces students to the procedures and testing conditions they will encounter during the examinations (Hamerslough, 2008; Jessee, 2002). According to testing theory, if a candidate performs well on an examination, the candidate should also perform well on other indicators of the same construct (Ranney et al., 2003). In other words, high performance on clinical competency assessments and/or on educational MB experiences should be a predictor for high scoring on licensure examinations. Accordingly, educational MB experiences have been accepted in dental and dental hygiene programs as common practice. However, research on the use of MBs and their effectiveness is limited.

Investigating educational MB experiences and their influence on licensure examinations, Jessee (2002) found no single aspect or any particular format of a MB had a statistically significant effect on the outcome of licensure examinations. Despite the results, Jessee (2002) believed educational MB experiences to be beneficial because they introduce students to procedures and testing conditions.

In another study investigating the effectiveness of educational MB experiences, Stewart, Bates, and Smith (2004) collected data from 1996 to 2003 that compared the University of Florida College of Dentistry (UFCD) students' clinical productivity and performance on MBs with performance on the Florida Dental Licensure Examination. Although Stewart et al. (2004) analysis did not find a consistent relationship between overall performance on MBs and performance on the licensure examination, they did find two out of seven aspects of the educational MB experiences had statistically significant predictability on the Florida Dental Licensure Examination; fixed prosthodontic preparation on dentofoms, and clinical Class II amalgams on patients. Stewart et al.

(2004) surmised that the positive predictability between these two procedures on educational MB experiences and success on the licensure examination might be due to the universally and well established procedure preparation criteria among teachers, students, and examiners and that these criteria are uniformly applied and reinforced during the MB experiences. Stewart et al. (2004) concluded that there are beneficial aspects to educational MB experiences in preparing candidates for licensure examinations.

Available research on the use and effectiveness of educational MB experiences in dental hygiene education is limited to comparative studies between educational MB experiences and the Dental Hygiene National Board Examination (DHNBE). Edenfield and Hansen (2000), using logistic regression, showed only a weak probability that the Joint Commission on National Dental Examinations (JCNDE) Dental Hygiene Mock Board predicted success on the DHNBE. In another study specifically researching the predictability of the JCNDE Dental Hygiene Mock Board, Dadian, Guerink, Olney, and Littlefield (2002) investigated the effectiveness of the JCNDE Dental Hygiene Mock Board as a tool for preparing dental hygiene students for the DHNBE. They found the JCNDE Dental Hygiene Mock Board to have a statistically significant effect in DHNBE preparation because it helped students gain familiarity to question formats and the overall exam experience. In predicting actual success on the DHNBE, Dadian et al. (2002) believed educational MB experiences might be valuable only in conjunction with other factors such as GPA. In researching various predictors for passing the DHNBE and the California State Dental Hygiene Board Examination, Hamerslough (2008) revealed a statistically significant relationship between the educational MB and experience created

by the faculty and success predictability on the DHNBE. Hamerslough (2008) concurred that an added value of the educational MB is that they allow students to experience the process and contents of the exam as well as assess their readiness level for taking the DHNBE.

## **Chapter 2 Summary**

Differences in learning levels require accurate assessment methods that evaluate students' knowledge and skills, progressively advancing the learner toward the level of competent. Clinical entry-level dental hygiene education has multiple factors that can obscure skill evaluation and affect student outcomes such as the variations in defining and assessing competency as well as the differences in the application of competency-based education. Faculty objectivity and calibration are also factors that complicate determining a true assessment of a student's ability. For these reasons, to grant licensure state licensing entities also rely on third-party licensure examinations to determine if the graduate has advanced to the level of competent and is safe for patient care. However, third-party examinations also have factors that can affect candidate outcomes enshrouding the exams in controversy.

Issues of validity call into question if third-party licensure examinations are true evaluators of skill and knowledge. For example, the one-shot exam approach is not considered to be authentic evaluation because the exams are unable to statistically correlate with other measures of performance such as GPA or class ranking and therefore cannot accurately predictor future performance. Extrinsic variable influences also cloak third-party licensure examinations in controversy, predominately evaluator bias and inconsistency and human subject variability.

Many variables can impact passing rates on the WREB DHE, LAE, and RE. However, controversies pertaining to issues of predictive validity are not appropriate to the WREB clinical examinations. The WREB examinations are not intended to predict future performance. Rather, by evaluating through criterion-based validity, the WREB examinations measure a candidate's abilities in areas of critical competencies, differentiating between adequate and inadequate performance (WREB, 2012). Regarding extrinsic variable influences, WREB policy and procedure dictate candidate anonymity removing examiner bias (WREB, 2014f). To decrease examiner inconsistency, the WREB examiners are required to review criteria and participate in standardization and calibration presentations and exercises prior to each exam (WREB, 2014f). Finally, although both the DHE and LAE necessitate the use of human patients, WREB assigns specific patient criteria reducing extrinsic patient variability. The WREB RE does not utilize human patients. Although controversies based on predictive validity and extrinsic variables are not appropriate to the WREB clinical examinations, they are still common arguments against third-party examinations. This is most likely due to the high-stakes implications of the exams.

Outcome decisions for third-party licensure examinations, such as the WREB clinical examinations have serious consequences and are therefore, considered high-stakes tests. State dental and dental hygiene licensing entities use these examinations as aids in determining if a candidate possesses entry-level knowledge and skills necessary for safe and competent practice. As a result of the high-stakes implications, entry-level dental hygiene programs use student performance on third-party licensure examinations for assessing their programs and implementing curricula changes. However, non-

successful attempts on licensure clinical examinations might not be a result of programming curricula or a candidate's clinical ability, but rather a result of student unpreparedness for the examination criteria and environment (Chambers, 2011; Jessee, 2002). Educational MB experiences might provide identifiers for clinical licensure examination outcomes and therefore might be beneficial to dental hygiene educators in identifying and counseling students who might be at risk for failure on the WREB clinical examinations.

### **Chapter 3 Methodology**

The purpose of the WREB DHE, LAE, and RE is to evaluate a candidate's clinical competence and ability to utilize professional judgment in areas of critical competencies (WREB, 2014d; WREB, 2014e; WREB, 2014g). By identifying candidates who possess some of the entry-level knowledge and skills, the WREB clinical examinations provide a reliable assessment for state dental hygiene licensing entities to use in making licensure decisions.

In order to prepare graduating dental hygiene students for third-party examinations necessary for licensure, such as the WREB clinical examinations, most entry-level dental hygiene programs administer educational MB experiences (Jessee, 2002). Differences by each program in testing criteria, examiner calibration, student remediation, and student self-assessments as well as variation in the number of MB experiences might influence licensure examination outcomes. Research on the use of educational MB experiences in entry-level dental hygiene education and the effectiveness specifically to the WREB clinical examinations is limited. If specific characteristics and criteria intensity levels of MB examination experiences have a relationship with student success with WREB examinations, then an awareness of these characteristics and intensity levels might assist educators in structuring educational MB experiences to more effectively prepare students. (Hamerslough, 2008; Jessee, 2002).

#### **Design**

**Overview of study.** This research compared WREB 2014 DHE, LAE, and RE candidate performance outcomes with characteristics and examination criteria intensity levels of the MB DHE, LAE, and RE experiences completed by students enrolled in



entry-level dental hygiene programs in Alaska, Idaho, Oregon, and Washington (n=23). In order to acquire information about the different dental hygiene program educational MB experiences, three questionnaires were developed to elicit responses about criteria that each program utilized. The three questionnaires were (1) MB DHE (see Appendix A), (2) MB LAE (see Appendix B), and (3) MB RE (see Appendix C).

Dental hygiene faculty members who were responsible for administering each 2013-2014 academic year student experience, such as an educational MB coordinator, completed each questionnaire. Program directors from CODA-accredited entry-level dental hygiene educational programs in Alaska, Idaho, Oregon, and Washington were recruited by an initial e-mail message with an overview and purpose of this study (see Appendix D) and a release form originally developed by WREB personnel and modified for this study (see Appendix E). The intent of the release form was to give the investigators permission to receive the programs' candidate performance outcome statistical data directly from WREB.

When permission was granted, the program directors were provided with an introductory e-mail message to forward to the appropriate faculty member such as the educational MB coordinator (see Appendix F). This introductory e-mail correspondence included an overview of the study, informed consent explanation of participation risks and benefits, a code number specific to the program, and a link to access the corresponding questionnaire. The questionnaire online sites included an introductory page with instructions and place for the participant to enter the code for their program. The code had to be entered in order to continue to the questionnaire and thus signifying agreement to participate in the study.

When permission was not granted to allow the investigators to receive the programs' candidate performance outcome statistical data directly from WREB, the program directors were asked to forward the questionnaires to faculty members responsible for coordinating the MBs. Although the data collected could not be compared to the candidate performance outcomes, the MB characteristic data provided insight to MB practices being used.

**Variables.** The independent variables were the Intensity Scores of the 2013-2014 academic year MB DHE, MB LAE, and MB RE based on the 2014 WREB clinical examination criteria. Variables also included noncriteria characteristics such as curriculum evaluation, examiner calibration, program response to student performance, student self-assessment, and variation in the number and timing of MB experiences. The dependent variable was candidate performance outcomes on the WREB 2014 DHE, LAE, and RE.

**Research design.** Because this study gathered information to describe and interpret characteristics and the relationship of MB examination criteria intensity levels with WREB examination outcomes, a descriptive comparative design was chosen. The purpose of descriptive research is to investigate "characteristics of particular subjects, groups, institutions, or situations" (LoBiondo-Wood & Haber, 2006, p. 240). Descriptive research collects information through the use of data reviews, questionnaires, observation, or interviews in order to describe the current state of the subject matter without manipulation of independent variables (Schiaveti, Metz, & Orlikoff, 2011). The comparative design is used to measure behavior of two or more subjects, such as clinical board examinations and educational MB experiences, at one point in time drawing

conclusions about similarities or differences and to determine or predict a cause-and-effect relationship among variables (Schiaveti, Metz, & Orlikoff, 2011). Through non-experimental quantitative data collection techniques, this design employed a survey research strategy using three questionnaires. Survey research strategies are used to provide detailed inspection of conditions, practices, or attitudes in a given environment (Schiaveti, Metz, & Orlikoff, 2011).

### **Description of Setting**

First the Program Director or institutional representative was provided with an introduction to the study and was asked to consent to the release of program examination data from WREB. Then each of the three questionnaires was completed by a faculty member who was responsible for coordinating the 2013-2014 academic year educational MB experiences. The release of data form and the questionnaires were completed online in the educator's dental hygiene program office or residence. An electronic device capable of accessing Qualtrics®, the online survey tool, was needed in this environment.

### **Research Participants**

Research participants for this study were entry-level dental hygiene program faculty members who were responsible for coordinating the MB DHE, MB LAE, or MB RE during the 2013-2014 academic year. The participants were identified by the dental hygiene program director or chair. An initial e-mail correspondence explaining the overview and purpose of this study (see Appendix D) was sent to all entry-level dental hygiene program directors in the states of Alaska, Idaho, Oregon, and Washington. Dental hygiene program director contact information was found on the ADHA website (ADHA, 2014). Contact information included the program director's telephone number,

physical address, and e-mail address. The program director or chair was the designee for distributing each questionnaire to dental hygiene faculty member who were responsible for administering the student MB experiences, such as an educational MB coordinator. Thus, there were potentially one to three educators from each participating institution who could of answered the questionnaire(s) (n=69).

**Sample description.** The sample was purposely selected to include educators (research participants) from entry-level dental hygiene programs whose students participated in the identified three WREB licensing examinations. According to the *WREB Candidate Educational Requirements* (2014a), candidates must show certification of successful completion from or current enrollment in a CODA-accredited dental hygiene school to be eligible to attempt the WREB DHE. To be able to attempt the WREB LAE and/or RE, the candidate must show local anesthesia and/or restorative course completion certification(s) from a CODA-accredited program (WREB, 2014a). Therefore, the primary sample population for this study included faculty members who were responsible for coordinating the MB DHE, MB LAE, or MB RE from CODA-accredited dental hygiene schools whose students participated in all three licensing examinations. Alaska had two CODA-accredited entry-level dental hygiene programs, Idaho had three, Oregon had eight, and Washington had 10 CODA-accredited entry-level dental hygiene programs (n=23).

Criteria for inclusion for the entry-level dental hygiene programs were (1) the programs must participate in all three WREB examinations, and (2) the programs must have been CODA-accredited. Criterion for inclusion for the participants was that the participants held a permanent or interim position as educational MB coordinator during

the 2013-2014 academic year. In the case of two or more educational MB coordinators for the same educational experience, one coordinator was assigned to be the designee for completing the questionnaire. Criteria for exclusion for the entry-level dental hygiene programs were (1) the program had been operational for one year or less, and (2) the program had not had students who had taken any of the WREB clinical examinations.

**Human subjects protection.** The Institutional Review Board (IRB) for Idaho State University (ISU) reviewed the research study application. According to the Human Subject Committee review, this study was not considered research involving human subjects and therefore did not need to be approved by the Human Subjects Committee.

Introductory e-mail correspondence with full disclosure of the planned study (see Appendix F) was distributed to the sample. The participants were informed that their participation would in no way affect their employment status or relationship with Idaho State University nor would it result in any compensation in addition to their regular salary/wages. Among the potential risks were maintaining participant confidentiality and anonymity. Codes were assigned to each institution to ensure anonymity and confidentiality of each program and participant. No identifying information was revealed in the study such as participants' names or program name or location. The results were only provided in aggregate forms. The master list of participating program codes was kept by the thesis advisor, Dr. Ellen Rogo, for seven years, after which it will be purged.

### **Data Collection**

The collection of data was the responses from the three questionnaires that aided in identifying characteristics and determining examination criteria intensity levels of each of the three MB experiences at each program. These three questionnaires were completed

by entry-level dental hygiene faculty members who were responsible for administering the 2013-2014 academic year student MB experiences, such as an educational MB coordinator.

**Procedure.** The WREB Board of Directors supported WREB involvement in this investigation and approved candidate success rates and mean score statistical data to be released to the primary investigator (see Appendix G). DHE, LAE, and RE candidate test result data was provided by WREB. The dental hygiene program director or chair was asked to sign the Permission to Obtain WREB Examination Data form (see Appendix E) allowing WREB to release their program's test result data. Data from WREB was de-identified and a code number was used in place of the program's name.

The data collection method for this study was provided through Qualtrics®, an online web-based survey system. Qualtrics® Inc. is a development cloud-based company that administers questionnaires through the Internet. This method of delivery was chosen for its ease of use, familiarity, affordability, site security, ability to handle multiple respondents, and ability to export data to Microsoft Excel ® and SPSS formats for analysis (Mackety, 2007).

The participants were provided with a code to de-identify the dental hygiene program where the participant was a faculty member. After the participant entered the code for the program, the participant was able to access the questionnaire. Each questionnaire was available for completion for an initial two-week period. The online parameters allowed the participants to start, stop, and restart the questionnaires. Open and end dates were arranged for the completion of the questionnaires and a reminder e-mail message (see Appendix H) was sent at a one-week interval to participants who did not

complete the questionnaires within the first week. A second time period of one-week for data collection occurred after the initial two-week period to attempt to reach non-responders. An e-mail correspondence was sent to request the final completion of the questionnaires prior to the second time period of one week for data collection (See Appendix I). A final e-mail correspondence reminder was sent to the program directors requesting to sign and return the Permission to Obtain WREB Examination Data form (Appendix J).

The responses from the completed questionnaires were downloaded into a Microsoft Excel ® software spreadsheet file. Descriptive analysis of frequency and percentages were used to identify common MB experience characteristic trends across programs. Characteristic data pertaining to criteria characteristics and examiner calibration were used to compute an Intensity Score and an Examiner Calibration Score based on the number of “Yes” responses divided by the total number of questions to compute a percentage score. The score scales were compared to candidate performance outcomes for the 2014 WREB DHE, LAE, and RE. Educational MB characteristic responses, such as course evaluation, student self-assessment, post educational MB experience procedures, and number and timing in the curriculum of MB experiences administered were analyzed using the descriptive statistics of frequency and percentages. Scores were determined by how many of the items were included in each of the MB examinations for each entry-level program. For each category, the number of “Yes” responses was divided by the number of items to compute a percentage score for each program. Four noncriteria characteristic variables were selected to compare to candidate performance outcomes for the 2014 WREB DHE, LAE, and RE: (1) examiner

calibration, (2) remediation, (3) student self-assessment, and (4) number of administered MB examinations. The characteristics of the educational MB experiences were compiled for the closed-ended and open-ended questions.

**Instruments.** The three instruments were self-designed and self-administered questionnaires that took approximately 20 minutes each to complete. The questions, or items, were designed to gain information about 2013-2014 academic year dental hygiene, local anesthesia, and restorative educational MB experiences. There were three separate self-administered questionnaires (1) MB DHE (see Appendix A), (2) MB LAE (see Appendix B) and, (3) MB RE (see Appendix C). Each questionnaire was divided into categories that inquire about examination criteria and characteristics specific to the MB experience. The types of items used were forced-choice questions with categorical responses and open-ended questions. Forced-choice questions included yes-no questions and multiple-choice questions.

MB DHE questionnaire categories were arranged as follows: 1) Demographics with 10 items, 2) Examiner Calibration with four items, 3) Course Evaluation with five items, 4) Preliminary Criteria with five items, 5) Equipment and Materials with five items, 6) General Patient Criteria with 15 items, 7) Oral Criteria with nine items, 8) Radiographic Criteria with nine items, 9) MB Procedure Criteria with 15 items, 10) MB Performance Grading Evaluation with 14 items, 11) Post MB Procedures with six items, 12) Student Self-Assessment with three items, 13) MB Attempts with two items, and 14) Other Questions with three items.

MB LAE questionnaire categories were arranged as follows: 1) Demographics with 10 items, 2) Examiner Calibration with six items, 3) Course Evaluation with five



items, 4) Preliminary Criteria with six items, 5) Equipment and Materials with four items, 6) General Patient Criteria with 17 items, 7) MB Procedure Criteria with 26 items, 8) MB Performance Grading Evaluation with 28 items, 9) Post MB Procedures with six items, 10) Student Self-Assessment with three items, 11) MB Attempts with two items, and 12) Other Questions with three items.

MB RE questionnaire categories were arranged as follows: 1) Demographics with 10 items, 2) Examiner Calibration with five items, 3) Course Evaluation with five items, 4) Preliminary Criteria with five items, 5) Equipment and Materials with seven items, 6) Dentoform Criteria with seven items, 7) Preparation Criteria with six items, 8) MB Procedure Criteria with 27 items, 9) MB Performance Grading Evaluation with 15 items, 10) Post MB Procedures with six items, 11) Student Self-Assessment with three items, 12) MB Attempts with two items, and 13) Other Questions with three items.

### **Validity and Reliability**

Survey research requires the investigator to know question construction and data analysis in order to produce a valid and reliable study (LoBiondo-Wood & Haber, 2006). The primary researcher consulted individuals with expertise in educational strategies, research methodology, and educational MBs to ensure criterion validity, content validity, and reliability of the questionnaire items.

**Criterion validity.** Criterion validity is the correlation of scores with standardized measures (Billings & Halstead, 2009). The standardized criterion needs to be valid, reliable, and available for measurement (Schiaveti, Metz, & Orlikoff, 2011). To develop questionnaire items relating specifically to educational MB examination criteria, this study established criterion validity by using WREB published criteria. Educational

MB criteria and procedures for each dental hygiene program's dental hygiene, local anesthesia, and restorative MB experiences were developed by using the published criteria from the corresponding WREB 2014 Candidate Guides and Policy and Procedures Manuals (WREB, 2014d; WREB, 2014e; WREB, 2014g).

**Content validity.** Content validity is the result of judging test content adequacy to a universal operational definition (Beckstead, 2009). To determine questionnaire item content validity for questions pertaining to noncriteria characteristics of clinical educational MB experiences in entry-level dental hygiene programs that prepare students for the WREB DHE, LAE, and RE, an Item Content Validity Index (I-CVI) was used. A panel of six dental hygiene professionals who had expertise in content, survey construction, and research methods were used as content experts. The panel was composed of dental hygiene educators who did not meet the inclusion criterion for this study. The content experts rated the questionnaire items on a four point Likert scale as: 1) not relevant, 2) somewhat relevant, 3) quite relevant, and 4) very relevant (Polit, & Beck, 2006). Items were determined valid when the experts agreed that the question is quite or very relevant at an 80% or higher rate (Polit, & Beck, 2006). When the agreement rate was below 80% for a question, then the question was revised or deleted.

**Instrument reliability.** Instrument reliability is the degree to which an instrument produces consistent scores (Mackety, 2007). The most direct method to determine reliability is to measure the same sample several times with the same instrument and then compare results (Brunette, 2007). One approach to determine an instrument's reliability is the test-retest. The test-retest involves two administrations of an instrument to the same people and reliability can be estimated by examining the consistency of the responses

(Brunette, 2007; Hendrickson, Massey, & Cronan, 1993). The primary researcher established reliability through test-retest analysis. A group of four educational MB experts were invited to participate in testing and retesting for each questionnaire. The group of experts was composed of retired educators who had recent experience as MB coordinators or educators who have recently changed positions and are no longer the MB administrator at an educational institution. A 0.08 agreement level was established for the test-retest reliability for each question; when a lower agreement rate was not reached, the question was revised or deleted. The Intraclass Correlation for the Dental Hygiene MB questionnaire was 0.98, the Local Anesthesia MB was .88 and the Restorative MB was .88.

### **Limitations**

Study limitations included the small sample size and its being representative of all dental hygiene programs who participate in WREB and; thus, results cannot be generalized to all U.S. programs or even all programs that are located in the western regional board parameters. Also, this study compared MB characteristics to WREB clinical board examination procedures and criteria and; therefore, the results cannot be generalized to other regional or state practical board examinations.

The survey research strategy has many limitations such as lack of depth, bias, and compliancy. Although questionnaires are practical, they collect relatively restricted information and have problems in determining accuracy and veracity to the respondents' answers (Schiaveti, Metz, & Orlikoff, 2011). Close-ended questions might restrict the candor of the answers. On the other hand, open-ended questions might illicit responses that are difficult to interpret (LoBiondo-Wood & Haber, 2006). In addition,

questionnaires might be a biased representation of the sample (Schiaveti, Metz, & Orlikoff, 2011). For example, respondents' answers might be a consequence of participant awareness of being part of the study. The Hawthorne effect is used to describe this impact on behavior that occurs as the result of the participant's perception of being observed (Nathe, 2011; Schiaveti, Metz, & Orlikoff, 2011; Zwane et al., 2011). Regarding this investigation, the Hawthorne effect described the possibility of participant increased awareness of WREB criteria and procedures that might influence responses toward their program education MB experiences. The Hawthorne effect was reduced by forming questionnaire items not involving intentions or predictions of measurement (Zwane et al., 2011).

A major concern for Internet-based questionnaires is difficulty getting participant attention and cooperation (Tierney, 2000). Generally, Internet-based questionnaires do not have good response rates, and also have issues of compliancy, lower response consistency, and technical issues (LoBiondo-Wood & Haber, 2006; Mackety, 2007). For example, item non-responses are items on a questionnaire that should have been answered, but are skipped (Mackety, 2007). Web-based questionnaire systems have immediate feedback features such as error checking, complex skip patterns, and pop-up windows that are designed to increase respondent attention and decrease item non-response (Mackety, 2007). However, immediate feedback features might irritate or overwhelm respondents, increasing item non-response and questionnaire abandonment (Mackety, 2007). Other technical issue concerns include initial e-mail correspondence to the respondents being misdirected as incoming unsolicited electronic junk, or spam mail as well as assumptions of the respondents having appropriate hardware, software,

settings, and Internet connectivity for the questionnaire to load, display, and function correctly (Mackety, 2007).

### **Proposed Statistical Analysis**

To describe noncriteria MB characteristics, descriptive statistics of frequency and percentages were used. The scores were determined by how many of the items were included in each of the MB examinations for each entry-level program. For each category, the number of “Yes” responses was divided by the number of items to compute a percentage score for each program. Chi-square analyses were conducted to determine relationships between noncriteria characteristic variables and candidate performance outcomes for WREB examinations.

To describe MB examination criteria characteristic intensity levels, statistics of frequency and percentages were used. For each MB examination criteria intensity category item, one point was given when the educational MB followed the criteria and procedures established by WREB. Followed criteria and procedures were determined by “Yes” item responses. No points were awarded if the MB item was not followed. The Intensity Score was computed by summing the total number of points divided by the total number of questions. Cronbach's alpha estimate of reliability was conducted on the raw items that were summed for each scale. The Intensity Scores reflected the percentage of WREB criteria to which the educational MB experiences adhered. The point-biserial correlation analysis was conducted to determine the relationship between the Intensity Scores and candidate performance outcomes on the WREB DHE and RE. Chi-square analyses were also conducted on the Pass or Fail candidate performance outcomes for all three WREB examinations. The alpha level was set at  $\leq 0.05$ .

**Summary of Chapter 3**

This chapter described the research design for investigating MB experiences as well as data collection methods, limitations, and statistical analysis. This study added to the research on the use of educational Mock Boards in dental hygiene education and their possible influence on clinical board examinations. This study provided insight to advantages of educational MB experience characteristics that influence the WREB clinical examinations.

Results and discussion will be reported in the form of a manuscript to be submitted for publication in ADEA Journal of Dental Education. The remaining sections of the thesis reflect the manuscript specifications outlined in the author guidelines contained in Appendix L.

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**Appendix A Data Collection Instrument: MB DHE Questionnaire**

## Mock Board Dental Hygiene Examination Questionnaire

Your participation is greatly appreciated. In the event that you have questions or concerns, please contact Dr. Ellen Rogo at (208) 282-3017 or [rogoelle@isu.edu](mailto:rogoelle@isu.edu). If you would like a copy of the survey results, please contact Ellen.

### Directions

- **This questionnaire is to be completed by clinical dental hygiene Mock Board coordinators only**
- Please complete the short online questionnaire as *honestly as possible* of your knowledge of the subject discussed
- Complete each question by clicking on the answer you feel is most appropriate and/or providing a short response when asked
- You may start, stop, and restart the questionnaire
- This questionnaire should take approximately 20 minutes to complete

Thank you for your time.

**By entering your program's code and beginning the survey, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.**

*<add text box for 4 digit code to be inserted>*

### **Questionnaire**

Does your program administer clinical dental hygiene educational Mock Board experience(s)?

- a. Yes
- b. No

Please identify below which category best identifies your demographic status by checking the appropriate answer.

### **Demographics**

1. What is your position title?
  - a. Chair or Director

- b. Clinic Coordinator/Supervisor
  - c. Faculty Member
  - d. Other, please identify your title
2. Are you a full or part-time employee?
- a. Part-time ( $\leq 20$  hours/week during the academic year)
  - b. Full-time ( $\geq 21$  hours/week during the academic year)
3. How many years have you been a dental hygiene educator?
- a. 1-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 16-20 years
  - e. 21-25 years
  - f. 26-30 years
  - g. More than 30 years
4. What is the highest degree you have earned?
- a. Associate
  - b. Bachelor
  - c. Master
  - d. Doctoral
  - e. Other, please specify
5. How many years have you been coordinating dental hygiene clinical Mock Board examinations at the end of the 2013-2014 academic year?
- a. 1-5 years

- b. 6-10 years
  - c. 11-15 years
  - d. 16-20 years
  - e. 21-25 years
  - f. 26-30 years
  - g. More than 30 years
6. Have you ever observed or participated in a WREB Clinical Dental Hygiene Examination? If yes, how many examinations have you observed or participated?
- a. Yes, 1 examination
  - b. Yes, 2-3 examinations
  - c. Yes, more than three examinations
  - d. No, I have not observed or participated in an examination
7. Have you attended a WREB Educators Session sponsored by WREB personnel? If yes, how many WREB Educators Sessions have you attended?
- a. Yes, 1 WREB Educators Session
  - b. Yes, 2-3 WREB Educators Sessions
  - c. Yes, more than three WREB Educators Sessions
  - d. No, I have not attended a WREB Educators Session
8. Were you an examiner for the WREB 2014 Dental Hygiene Examination?
- a. Yes
  - b. No

9. How many faculty members at your dental hygiene program are WREB examiners?

<insert text box>

10. What degree do your entry-level students earn?

- a. Certificate
- b. Associate of Science
- c. Associate of Applied Science
- d. Other Associate degree, please specify
- e. Bachelor of Science
- f. Other Bachelor degree, please specify
- g. Other, please specify

Please identify below which criteria/definition you incorporated into your 2013-2014 academic year Clinical Dental Hygiene Examination Mock Board experiences for your students by checking the appropriate answer.

**Examiner Calibration**

- 1. Are examiners calibrated on patient check-in procedure/criteria prior to the Mock Board examination?
  - a. Yes
  - b. No
- 2. Are examiners calibrated on patient check-out procedure/criteria prior to the Mock Board examination?
  - a. Yes
  - b. No

3. Is the calibration conducted on dentoforms?
  - a. Yes
  - b. No
4. Do the examiners calibrate using the WREB required instruments: #4/5 mirror, #11/12 Explorer, UNC #12 probe?
  - a. Yes
  - b. No

### **Course Evaluation**

1. Is (are) the completion of the clinical Mock Board examination experience(s) a course requirement?
  - a. Yes
  - b. No
2. What type of grade do the students earn for their clinical Mock Board examination experience?
  - a. Numerical grade
  - b. Pass/fail score ( $\geq 75$  = Pass and  $\leq 74$  = Fail)
  - c. No grade
  - d. Other, please specify  
*<Insert text box>*
3. What percentage of the course final grade in a curriculum course is the clinical Mock Board examination?
  - a. None
  - b. 1% - 10%

- c. 11% - 20%
  - d. 21% - 30%
  - e. 31% - 40%
  - f. 41% - 50%
  - g. More than 50%
4. Is the clinical Mock Board examination “competency-based” indicating the student is successful or not successful in a course (e.g. Clinical Dental Hygiene, Capstone Course, or other)?
- a. Yes
  - b. No
  - c. Other, please specify
5. Is completion of course prerequisites required to participate in the clinical Mock Board examination experience (e.g. achieve an 85% in course, complete 12 or more patients, achieve an 85% in deposit removal, etc.)?
- a. Yes, please explain the course prerequisite
  - b. No

**Preliminary Criteria**

1. Are students required to study the online tutorial for the WREB Dental Hygiene Examination prior to the Mock Board examination experience?
- a. Yes
  - b. No
2. Are students required to attend a mandatory orientation session to review policies and procedures prior to the clinical Mock Board examination?



- a. Yes
  - b. No
3. Are students assigned a candidate number?
- a. Yes
  - b. No
4. Are students kept anonymous from the examiners?
- a. Yes
  - b. No
5. Does a faculty member fulfill the role of Chief Examiner to act as a liaison between the students and the examiners?
- a. Yes
  - b. No

### **Equipment and Materials**

Are students:

1. Required to use the WREB identified instruments: #4/5 mirror, #11/12 Explorer, UNC #12 probe?
- a. Yes
  - b. No
2. Required to use WREB identified equipment: blood pressure measuring device, candidate and patient protective eyewear, napkin holder, local anesthesia armamentarium (if needed), and ballpoint/red pen?
- a. Yes
  - b. No

3. Required to use the WREB Forms or forms similar to WREB forms: Patient Medical History/Consent, Continuing Care, Submission Sheet, Limitation of Liability, Candidate Critique, Medication/Anesthesia Dosage Form, and Patient Info/Questionnaire?
  - a. Yes
  - b. No
4. Required to follow the WREB administration of local anesthesia criteria: No local anesthesia prior to check-in, use of topical prior to check-in, administered by qualified practitioner (excluding Examiners) if student not qualified, no nitrous oxide permitted?
  - a. Yes
  - b. No
5. Prohibited from using nitrous oxide analgesia?
  - a. Yes
  - b. No

**General Patient Criteria**

Must the clinical Mock Board patient be/have:

1. Eighteen years or older?
  - a. Yes
  - b. No
2. Not a dentist, dental hygienist, or dental hygiene student?
  - a. Yes, the MB patient cannot be a dentist, dental hygienist, or a dental student

- b. No, the MB patient can be a dentist, dental hygienist, or a dental student
- 3. Written clearance from a health care provider if pregnant?
  - a. Yes
  - b. No
- 4. Written clearance and/or antibiotic prophylaxis for joint prosthesis, artificial heart valves, history of infective endocarditis, serious congenital heart conditions, or cardiac/organ transplant?
  - a. Yes
  - b. No
- 5. Blood pressure and pulse readings taken less than an hour prior to the scheduled clinic time?
  - a. Yes
  - b. No
- 6. Systolic reading 159 or below and diastolic reading of 99 or below for acceptance?
  - a. Yes
  - b. No
- 7. Not accepted with a diastolic greater than 180 or a diastolic reading greater than 110?
  - a. Yes
  - b. No
- 8. Written clearance from a health care provider if the systolic blood pressure is between 160 and 180 or the diastolic blood pressure is between 100 and 110?

a. Yes

b. No

9. No prodromal, vesicle, or ulcerated orofacial herpes?

a. Yes

b. No

10. No heart attack, stroke or cardiac surgery in the prior six months?

a. Yes

b. No

11. No active tuberculosis?

a. Yes

b. No

12. No latex allergy or sensitivity to latex?

a. Yes

b. No

13. No intravenous bisphosphonate therapy?

a. Yes

b. No

14. No condition, medication, or drug history that might be adversely aggravated by the length or nature of the examination?

a. Yes

b. No

15. No cocaine or methamphetamine drugs used within 24 hours prior to the Mock Board examination?

- a. Yes
- b. No

### **Oral Conditions Criteria**

Do you require:

1. One quadrant and up to four additional teeth to qualify?
  - a. Yes
  - b. No
2. That the quadrant must have a permanent molar with a proximal contact and six natural teeth?
  - a. Yes
  - b. No
3. Twelve qualifying surfaces of heavy, subgingival calculus?
  - a. Yes
  - b. No
4. That 3 of the 12 qualifying surfaces be located on molars?
  - a. Yes
  - b. No
5. That no more than 4 of the 12 surfaces can be located on the mandibular anterior?
  - a. Yes
  - b. No
6. The use of “Qualifying Surface” definition of heavy calculus: Significant deposit, readily discernible/detectable, binds explorer, interproximal deposit

detected from lingual and/or facial, and subgingival ledge or partial ledge encircling tooth?

- a. Yes
- b. No

7. That the qualifying surface must not have probing depths greater than six millimeters with a one millimeter leeway, Class III furcations or Class III mobility, orthodontic bands, overhanging margins, temporary or faulty restorations that extend subgingivally, gross subgingival caries, or caries that interferes with calculus removal, and/or patient comfort?

- a. Yes
- b. No

8. Exempt teeth do not qualify: Supernumerary teeth, third molar partially erupted with tissue covering any portion of the occlusal surface, implants, and retained roots and no clinical crown?

- a. Yes
- b. No

9. The use of resubmission or new patient submission if oral conditions are not met?

- a. Yes
- b. No

### **Radiographic Criteria**

Do you require:

1. Conventional, duplicate, or printed digital radiographs taken within 12 months?

- a. Yes
  - b. No
2. That radiographs must include all teeth in the treatment submission?
- a. Yes
  - b. No
3. The use of horizontal or vertical posterior bitewings and anterior and posterior periapicals?
- a. Yes
  - b. No
4. Posterior teeth to be visible on both bitewing and periapical films?
- a. Yes
  - b. No
5. The use of a supplemental diagnostic panograph for qualifying third molars only?
- a. Yes
  - b. No
6. The use of duplicates for candidate use?
- a. Yes
  - b. No
7. Examiners to award a 4 point penalty for radiographs that do not meet the radiographic technique evaluation criteria: full crown visible, open contacts and the ability to see the DEJ, alveolar crestal bone visible, and the apex and bone circumscribing the entire root visible?

- a. Yes
  - b. No
8. Examiners to reject a patient based on incomplete or non-diagnostic radiographs?
- a. Yes
  - b. No
9. The use of resubmission criteria or submission of a different patient?
- a. Yes
  - b. No

### **Mock Board Examination Procedure Criteria**

Do you require/allow:

1. Sharing of patients on the same day except for patients requiring antibiotic prophylaxis and patients diabetes controlled by insulin injection(s) or an insulin infusion?
  - a. Yes
  - b. No
2. The use of “no show” and student examination forfeit when the patient is unacceptable and the student is unable to find an alternate patient who complies with the patient criteria?
  - a. Yes
  - b. No
3. Forty-five minutes to submit a patient?
  - a. Yes



- b. No
- 4. Examiners award a penalty for late submission of three minutes deducted from clinic time for each minute the patient is late for Check-In?
  - a. Yes
  - b. No
- 5. Up to three patient submissions for students whose initial patient was rejected?
  - a. Yes
  - b. No
- 6. The Chief Examiner or a person who acts as a liaison between the students and the examiners to verify paperwork (e.g. Patient Medical History/Consent form, Patient Continuing Care form, Submission Sheet, Limitation of Liability)?
  - a. Yes
  - b. No
- 7. The completion of forms (e.g. Patient Medical History/Consent form, Patient Continuing Care form, Submission Sheet, Limitation of Liability) prior to patient submission?
  - a. Yes
  - b. No
- 8. A minimum of three examiners to evaluate the patient for non-qualifying criteria?
  - a. Yes
  - b. No

9. The use of more than three examiners when the candidate requires an alternate or third submission?
- a. Yes
  - b. No
10. Examiners to select 12 surfaces of heavy subgingival calculus for grading?
- a. Yes
  - b. No
11. Examiners to select 24 probing and recession areas for grading?
- a. Yes
  - b. No
12. Students two hours to complete the Mock Board examination?
- a. Yes
  - b. No
13. The use of periodontal assessment criteria: recorded after calculus removal, six sulcus depths for each tooth, facial and lingual gingival recession apical to the cemento-enamel junction (CEJ) for each tooth in submitted quadrant?
- a. Yes
  - b. No
14. The preselected surfaces to be independently evaluated by a minimum of three examiners?
- a. Yes
  - b. No
15. Calculus removal is based on thoroughness and soft tissue management?

- a. Yes
- b. No

### **Performance Grading Evaluation**

Is/Are:

1. A passing score 75 points or above?
  - a. Yes
  - b. No
2. There 100 possible points for the Mock Board examination?
  - a. Yes
  - b. No
3. Twenty-five points used for probe depths/recession?
  - a. Yes
  - b. No
4. Seventy-five points used for calculus removal and tissue management?
  - a. Yes
  - b. No
5. An “error” validated by two or more examiners?
  - a. Yes
  - b. No
6. A maximum of two and one-half points deducted for one or more recession errors?
  - a. Yes
  - b. No

7. Four points deducted for rejection of each patient submission?
  - a. Yes
  - b. No
8. One and one-quarter points deducted for each probing error up to a maximum of 22.5 points?
  - a. Yes
  - b. No
9. Six and one-quarter points deducted for each calculus error?
  - a. Yes
  - b. No
10. A calculus error defined as subgingival and/or supragingival, discernible, burnished or clickable?
  - a. Yes
  - b. No
11. Six points deducted for each tissue trauma error?
  - a. Yes
  - b. No
12. A tissue trauma error defined as any iatrogenic damage to extra/intraoral tissues, tissue tags, lacerations, burns, or amputated papilla?
  - a. Yes
  - b. No
13. Five or more tissue trauma errors require remediation?
  - a. Yes

b. No

14. One point deducted for each minute the patient is late for check-out?

a. Yes

b. No

### **Clinical Dental Hygiene Mock Board Post Examination Procedures**

1. Do students receive a written critique of their performance?

a. Yes

b. No

2. Do you have a review session with the entire class to discuss the students' overall strengths and weaknesses?

a. Yes

b. No

3. Do you <have> review performance with every student on an individual basis?

a. Yes

b. No

4. Do you **only** review performance with students who do not pass?

a. Yes

b. No

5. For non-successful attempts, do you require students to complete a Mock Board examination experience until a passing score has been achieved?

a. Yes

b. No

6. Do you provide remediation for those who are not successful on the Mock Board examination?

- a. Yes, please describe <text box>
- b. No

### **Student Self-Assessment**

Student self-assessment is a learning experience through specific assessment and qualitative judgment based on student critical self-reflection (Billings & Halstead, 2009). Examples of student self-assessment include written presentations such as journals or blogs, oral presentations, expectation checklists, and self-monitoring rubrics.

1. Do you have your students self-assess their **experience** on the Mock Board examination (e.g. patient selection, preparation, time allocation, etc.) prior to receiving exam results?
  - a. Yes
  - b. No
2. Do you have your students self-assess their **performance** on the Mock Board examination (e.g. patient management, calculus removal, periodontal assessment, etc) prior to receiving exam results?
  - a. Yes
  - b. No
3. How do students complete their self-assessment of the Mock Board examination experience or performance?
  - a. Written only
  - b. Oral only

- c. Both written and oral
- d. N/A

### **Number of Clinical Dental Hygiene Mock Board Examination Experiences**

1. Do your students participate in:
  - a. One clinical dental hygiene Mock Board examination throughout their education?
  - b. Two clinical dental hygiene Mock Board examinations throughout their education?
  - c. Three or more clinical dental hygiene Mock Board examinations throughout their education?
2. Please identify when (e.g., 4<sup>th</sup> semester in a 4 semester program)

<Insert Text Box>

### **Other Questions**

1. Do you incorporate other aspects into your program's clinical dental hygiene Mock Board examination that are not mentioned above?
  - a. Yes, please describe
  - b. No
2. What would facilitate your inclusion of all WREB criteria into your program's clinical dental hygiene Mock Board examination?
  - a. Already include all of WREB criteria
  - b. Do not include all criteria and would if: please explain
3. If there have been any changes made to your program's clinical dental hygiene Mock Board examination in the past three years, what were the changes and

what impact have the changes made on student performance on the WREB  
Dental Hygiene Examination?

### References

- Billings, D. M., Halstead, J. A. (2009). *Teaching in nursing: A guide for faculty* (3<sup>rd</sup> ed.).  
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- Western Regional Examining Board. (2014). *2014 Dental hygiene examination candidate  
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**Appendix B Data Collection Instrument: MB LAE Questionnaire**

## **Mock Board Local Anesthesia Examination Questionnaire**

Your participation is greatly appreciated. In the event that you have questions or concerns, please contact Dr. Ellen Rogo at (208) 282-3017 or [rogoelle@isu.edu](mailto:rogoelle@isu.edu). If you would like a copy of the survey results, please contact Ellen.

### Directions

- **This questionnaire is to be completed by local anesthesia Mock Board coordinators only**
- Please complete the short online questionnaire as *honestly as possible* of your knowledge of the subject discussed
- Complete each question by clicking on the answer you feel is most appropriate and/or providing a short response when asked
- You may start, stop, and restart the questionnaire
- This questionnaire should take approximately 20 minutes to complete

Thank you for your time.

**By entering your program's code and beginning the survey, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.**

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### **Questionnaire**

Does your program administer Local Anesthesia educational Mock Board experience(s)?

- a. Yes
- b. No

Please identify below which category best identifies your demographic status by checking the appropriate answer.

### **Demographics**

1. What is your position title?
  - a. Chair or Director
  - b. Clinic Coordinator or Supervisor

- c. Faculty Member
  - d. Other, please identify your title
2. Are you a full or part-time employee?
- a. Part-time ( $\leq 20$  hours/week during the academic year)
  - b. Full-time ( $\geq 21$  hours/week during the academic year)
3. How many years have you been a dental hygiene educator?
- a. 1-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 16-20 years
  - e. 21-25 years
  - f. 26-30 years
  - g. Over 30 years
4. What is the highest degree you have earned?
- a. Associate
  - b. Bachelor
  - c. Master
  - d. Doctoral
  - e. Other, please specify
5. How many years have you been coordinating local anesthesia Mock Board examinations at the end of the 2013-2014 academic year?
- a. 1-5 years
  - b. 6-10 years

- c. 11-15 years
  - d. 16-20 years
  - e. 21-25 years
  - f. 26-30 years
  - g. Over 30 years
6. Have you ever observed a WREB Local Anesthesia Examination? If yes, how many examinations have you observed or participated?
- a. Yes, 1 examination
  - b. Yes, 2-3 examinations
  - c. Yes, more than three examinations
  - d. No, I have not observed or participated in an examination
7. Have you attended a WREB Educators Session sponsored by WREB personnel? If yes, how many WREB Educators Sessions have you attended?
- a. Yes, 1 WREB Educators Session
  - b. Yes, 2-3 WREB Educators Sessions
  - c. Yes, more than three WREB Educators Sessions
  - d. No, I have not attended a WREB Educators Session
8. Were you an examiner for the WREB 2014 Local Anesthesia Examination?
- a. Yes
  - b. No
9. How many faculty members at your dental hygiene program are WREB examiners?
- a. <insert text box>

10. What degree do your entry-level students earn?

- a. Certificate
- b. Associate of Science
- c. Associate of Applied Science
- d. Other Associate degree, please specify
- e. Bachelor of Science
- f. Other Bachelor degree, please specify
- g. Other, please specify

Please identify below which criteria/definition you incorporated into your 2013-2014 academic year Local Anesthesia Examination Mock Board Experiences for your students by checking the appropriate answer.

**Examiner Calibration**

1. Are examiners calibrated on candidate clinical preparation procedure/criteria prior to the Mock Board?
  - a. Yes
  - b. No
2. Are examiners calibrated on local anesthesia administration procedure/criteria prior to the Mock Board?
  - a. Yes
  - b. No
3. Are examiners calibrated on the WREB Critical Aspects of injection prior to the Mock Board: Proper utilization of medical history and proper anesthetic selection, manual aspirating syringe selection and preparation, proper penetration of each

injection, proper angle and depth of each injection, aspiration, amount of anesthesia is no more than  $\frac{1}{4}$  of the cartridge, rate of injection is not excessively rapid, single handed method for handling of sharps, and excessive trauma?

a. Yes

b. No

4. Are examiners calibrated on the WREB Less Critical Aspects of injection prior to the Mock Board: Required armamentarium (protective eyewear for both patient and clinician, hemostat or locking forceps are on the tray, and anesthetic is not expired), required syringe preparation and handling (harpoon is securely engaged, bubbles are expelled from the cartridge, and expelled solution is no more than a width of a stopper), and syringe kept out of patient's sight?

a. Yes

b. No

5. Is the calibration conducted in a clinical setting with a patient(s)?

a. Yes

b. No

6. Do the examiners calibrate using the WREB required instruments such as an aspirating syringe and do not use the WREB prohibited instruments such as disposable, non-threading, self-capping, and self-aspirating syringes?

a. Yes

b. No

### **Course Evaluation**

1. Is (are) the completion of the Mock Board examination experience(s) a course requirement?
  - a. Yes
  - b. No
2. What type of grade do the students earn for their local anesthesia Mock Board experience?
  - a. Numerical grade
  - b. Pass/fail score ( $\geq 75$  = Pass and  $\leq 74$  = Fail)
  - c. No grade
  - d. Other, please specify
3. What percentage of the course final grade in a curriculum course is the Mock Board examination?
  - a. None
  - b. 1-10%
  - c. 11-20%
  - d. 21-30%
  - e. 31-40%
  - f. 41-50%
  - g. More than 50%
4. Is the Mock Board examination “competency-based” indicating the student is successful or not successful in a course (e.g. Clinical Dental Hygiene, Capstone Course, or other)?
  - a. Yes

- b. No
  - c. Other, please specify
- 5. Is completion of course prerequisites required to participate in the Mock Board examination experience (e.g. certain number of successful experiences with both injections)?
  - a. Yes, please explain the course prerequisite
  - b. No

**Preliminary Criteria**

1. Are students required to attend a mandatory orientation session to review process and procedures prior to the Mock Board examination?
  - a. Yes
  - b. No
2. Are students required to participate in written Mock Board in addition to the clinical Mock Board examination?
  - a. Yes
  - b. No
3. Must the student pass the written Mock Board with a 75% or higher to be eligible to participate in the clinical Mock Board?
  - a. Yes
  - b. No
  - c. N/A
4. Do students receive and review an anesthesia instruction sheet similar to the WREB Anesthesia Instruction Sheet prior to the Mock Board examination?



- a. Yes
  - b. No
5. Are students assigned a Candidate number?
- a. Yes
  - b. No
6. Does a faculty member fulfill the role of Chief Examiner to act as a liaison between the students and the examiners?
- a. Yes
  - b. No

### **Equipment and Material**

Are students required to use:

1. Aspirating syringes and not permitted to use disposable, non-threading, self-capping, or self-aspirating syringes?
  - a. Yes
  - b. No
2. Non self-capping needles?
  - a. Yes
  - b. No
3. WREB identified equipment: hemostat or locking forceps, blood pressure measuring device, candidate and patient protective eyewear, napkin holder?
  - a. Yes
  - b. no

4. WREB Forms or forms similar to WREB forms: Medical History/Consent, Candidate Limitation of Liability, Anesthesia Information Sheet, and Candidate Critique?
  - a. Yes
  - b. No

**General Patient Criteria**

Must the Mock Board patient be/have:

1. Maxillary second molars?
  - a. Yes
  - b. No
2. At least one premolar in each mandibular quadrant?
  - a. Yes
  - b. No
3. Only one student's patient (e.g. no sharing of patients)?
  - a. Yes
  - b. No
4. Eighteen years or older?
  - a. Yes
  - b. No
5. Not a dental hygiene educator?
  - a. Yes
  - b. No
6. Written clearance from a health care provider if pregnant?

- a. Yes
  - b. No
7. Blood pressure and pulse readings taken less than an hour prior to the scheduled clinic time?
- a. Yes
  - b. No
8. Systolic reading 159 or below and diastolic reading of 99 or below for acceptance?
- a. Yes
  - b. No
9. Not accepted with a systolic greater than 180 or diastolic reading greater than 110?
- a. Yes
  - b. No
10. Written clearance from a health care provider if the systolic blood pressure is between 160 and 180 or the diastolic blood pressure is between 100 and 110?
- a. Yes
  - b. No
11. No prodromal, vesicle, or ulcerated orofacial herpes?
- a. Yes
  - b. No
12. No heart attack, stroke or cardiac surgery in the prior six months?
- a. Yes

b. No

13. No active tuberculosis?

a. Yes

b. No

14. No latex allergy or sensitivity to latex?

a. Yes

b. No

15. No intravenous bisphosphonate therapy?

a. Yes

b. No

16. No condition, medication, or drug history that might be adversely aggravated by the length or nature of the examination?

a. Yes

b. No

17. No cocaine or methamphetamine drugs used within 24 hours prior to the Mock Board?

a. Yes

b. No

### **Mock Board Examination Procedure Criteria**

Do you require/allow:

1. The use of two possible submissions?

a. Yes

b. No

2. A second submission, without penalty, if the patient is rejected for intraoral sores, active orofacial herpes or high blood pressure?
  - a. Yes
  - b. No
3. The use of “no show” and student examination forfeit when the patient is unacceptable and the student is unable to find an alternate patient who complies with the patient criteria?
  - a. Yes
  - b. No
4. Students a maximum of 60 minutes to complete required forms, set up the operatory, prepare syringes, and seat the patient before their MB examination?
  - a. Yes
  - b. No
5. Students to complete the Patient Medical History/Patient Consent and Anesthesia Information Sheet prior to seating the patient?
  - a. Yes
  - b. No
6. Only two prepared syringes to be present on the tray?
  - a. Yes
  - b. No
7. Examiners to proceed to the next candidate for those candidates not ready at their scheduled times?
  - a. Yes

b. No

8. The IA Nerve Block as one of two injections for your Mock Board examination?

a. Yes

b. No

9. If yes, do you require students to perform the IA Injection first?

a. Yes

b. No

c. N/A

10. The PSA Nerve Block as one of two injections for your Mock Board examination?

a. Yes

b. No

11. An examiner to check the potential sites for presence of sores or puncture marks?

a. Yes

b. No

12. Students to prepare the injection sites with topical anesthetic?

a. Yes

b. No

13. Students to point out the red markings on cartridge, if present, to avoid confusion with a positive aspiration?

a. Yes

b. No

14. Students to rotate the bar code on the cartridge toward the small window in order to not obstruct the ability to see a positive aspiration?
- a. Yes
  - b. No
15. Two examiners to observe the student's technique while administering injections?
- a. Yes
  - b. No
16. Students to perform the injections on the same side and/or on either side of the mouth?
- a. Yes
  - b. No
17. Examiners to interrupt and stop the procedure at any time for health or safety risk?
- a. Yes
  - b. No
18. Students to inform the examiners upon reaching each of the three critical phases of the injection: initial penetration, angle and depth, and aspiration?
- a. Yes
  - b. No
19. Students to use the same syringe and needle or a new syringe and needle for each injection?
- a. Same syringe and needle for each injection
  - b. New syringe and needle for each injection

20. Examiners to tell students when to stop depositing anesthetic solution?
- a. Yes
  - b. No
21. Students to reposition the needle and aspirate again upon one positive aspiration?
- a. Yes
  - b. No
22. Students to withdraw and end the injection after positive aspirations on two attempts?
- a. Yes
  - b. No
23. Examiners to grade the second attempt as performed?
- a. Yes
  - b. No
24. Examiners to leave the unit to confer after observing the injections?
- a. Yes
  - b. No
25. Examiners to return to the unit to dismiss the patient or repeat an injection on the opposite side of the mouth?
- a. Yes
  - b. No
26. Students to pass both injections to pass the exam?
- a. Yes
  - b. No



**Performance Grading Evaluation**

Do you require the following critical aspects *must* be performed to specifications for a passing grade?

1. Proper utilization of medical history and proper anesthetic selection?
  - a. Yes
  - b. No
2. Proper syringe selection and preparation?
  - a. Yes
  - b. No
3. The needle not to touch any extra-oral surface or facial anatomy prior to the injection?
  - a. Yes
  - b. No
4. If the needle touches any extra-oral surface or facial anatomy prior to the injection, does the student automatically fail that injection?
  - a. Yes
  - b. No
5. The needle not to touch any intra-oral object, such as gauze or a glove prior to penetration?
  - a. Yes
  - b. No
6. If the needle touches any intra-oral object, such as gauze or a glove prior to penetration, does the student automatically fail that injection?

- a. Yes
  - b. No
7. The maximum use of three separate penetrations to reach optimum angle and depth of each injection?
- a. Yes
  - b. No
8. The IA injection is initiated at the appropriate penetration site according to WREB criteria: The area bordered medially by the pterygomandibular raphe, laterally by the internal oblique ridge, and at the height of the coronoid notch?
- a. Yes
  - b. No
9. The PSA injection is initiated at the appropriate penetration site according to WREB criteria: At the height of the vestibule in the mucobuccal fold posterior to the zygomatic process of the maxilla (visually, this approximates the distal facial root of the 2nd molar)?
- a. Yes
  - b. No
10. Appropriate angle for the IA injection is achieved according to WREB criteria: At the point when optimum depth is achieved, the barrel of the syringe is over the premolars on the contralateral side and the needle is parallel to the occlusal plane of the mandibular teeth?
- a. Yes
  - b. No

11. Optimum depth for the IA injection is achieved according to WREB criteria: The depth of insertion is 20 to 25 mm (approximately  $\frac{2}{3}$  the length of a long needle or  $\frac{4}{5}$  the length of a short needle)?
- a. Yes
  - b. No
12. Appropriate angle for the PSA injection is achieved according to WREB criteria: The needle is advanced upward  $45^\circ$  to the occlusal plane, inward at a  $45^\circ$  angle toward the midline, and backward at a  $45^\circ$  angle to the long axis of the second molar?
- a. Yes
  - b. No
13. Optimum depth for the PSA injection is achieved according to WREB criteria: The depth of insertion is approximately 16 mm (about  $\frac{1}{2}$  the length of a long needle or  $\frac{3}{4}$  the length of a short needle)?
- a. Yes
  - b. No
14. The large window of the syringe is toward the operator?
- a. Yes
  - b. No
15. Students announce if the aspiration is either positive or negative?
- a. Yes
  - b. No

16. No more than  $\frac{1}{4}$  of the cartridge solution to be deposited before reaching the deposition site?

- a. Yes
- b. No

17. The rate of administration not to be excessively rapid?

- a. Yes
- b. No

18. If both examiners validate excessive trauma, such as excessive bending/bowing of the needle or laceration of the tissue, the injection is failed?

- a. Yes
- b. No

19. Single-handed method to recap the needle?

- a. Yes
- b. No

Does your Mock Board examination consider the following aspects as less critical?

1. Protective eyewear worn by the student?

- a. Yes
- b. No

2. Protective eyewear worn by the patient?

- a. Yes
- b. No

3. Hemostat or locking forceps on the tray?

- a. Yes

- b. No
- 4. Anesthetic is not expired?
  - a. Yes
  - b. No
- 5. Harpoon is securely engaged?
  - a. Yes
  - b. No
- 6. Bubbles are not expelled from the cartridge?
  - a. Yes
  - b. No
- 7. Expelled solution is no more than a width of a stopper?
  - a. Yes
  - b. No
- 8. Syringe is not in the patient's sight?
  - a. Yes
  - b. No
- 9. Do you require injection failure if three of the less critical aspects are inadequate?
  - a. Yes
  - b. No

#### **Local Anesthesia Mock Board Post Examination Procedures**

- 1. Do students receive a written critique of their performance?
  - a. Yes
  - b. No

2. Do you have a review session with the entire class to discuss the students' overall strengths and weaknesses?
  - a. Yes
  - b. No
3. Do you review performance with every student on an individual basis?
  - a. Yes
  - b. No
4. Do you **only** review performance with students who do not pass?
  - a. Yes
  - b. No
5. For non-successful attempts, do you require students to complete a Mock Board examination experience until a passing score has been achieved?
  - a. Yes
  - b. No
6. Do you provide remediation for those who are not successful on the Mock Board examination?
  - a. Yes, please describe
  - b. No

### **Student Self-Assessment**

Student self-assessment is a learning experience through specific assessment and qualitative judgment based on student critical self-reflection (Billings & Halstead, 2009). Examples of student self-assessment include written presentations such as journals or blogs, oral presentations, expectation checklists, and self-monitoring rubrics.

1. Do you have your students self-assess their **experience** on the Mock Board examination (e.g. patient selection, preparation, time allocation, etc.) prior to receiving exam results?
  - a. Yes
  - b. No
2. Do you have your students self-assess their **performance** on the Mock Board examination (e.g. patient management, injection technique, such as penetration site, injection rate, and deposit rate, etc.) prior to receiving exam results?
  - a. Yes
  - b. No
3. How do students complete their self-assessment of the Mock Board examination experience or performance?
  - a. Written only
  - b. Oral only
  - c. Both written and oral
  - d. N/A

#### **Number of Local Anesthesia Mock Board Examination Experiences**

1. Do your students participate in:
  - a. One local anesthesia Mock Board examination throughout their education?
  - b. Two local anesthesia Mock Board examinations throughout their education?

- c. Three or more local anesthesia Mock Board examinations throughout their education?
2. Please identify when (e.g., 4<sup>th</sup> semester in a 4 semester program)

<Text Box Only>

### **Other Questions**

1. Do you incorporate other aspects into your program's clinical dental hygiene Mock Board examination that are not mentioned above?
  - a. Yes, please describe
  - b. No
2. What would facilitate your inclusion of all WREB criteria into your program's clinical dental hygiene Mock Board examination?
  - a. Already include all of WREB criteria
  - b. Do not include all criteria and would if: please explain
3. If there have been any changes made to your program's clinical dental hygiene Mock Board examination in the past three years, what were the changes and what impact have the changes made on student performance on the WREB Local Anesthesia Examination?

### **References**

- Billings, D. M., Halstead, J. A. (2009). *Teaching in nursing: A guide for faculty* (3<sup>rd</sup> ed.). St. Louis, MO: Saunders Elsevier.
- Western Regional Examining Board. (2014). *2014 Anesthesia examination candidate guide*. Retrieved from



[https://www.wreb.org/Candidates/Hygiene/hygienePDFs/WREB\\_2014\\_CAN\\_Guide\\_ANE.pdf](https://www.wreb.org/Candidates/Hygiene/hygienePDFs/WREB_2014_CAN_Guide_ANE.pdf)

**Appendix C Data Collection Instrument: MB RE Questionnaire**

### Mock Board Restorative Examination Questionnaire

Your participation is greatly appreciated. In the event that you have questions or concerns, please contact Dr. Ellen Rogo at (208) 282-3017 or [rogoelle@isu.edu](mailto:rogoelle@isu.edu). If you would like a copy of the survey results, please contact Ellen.

#### Directions

- **This questionnaire is to be completed by restorative Mock Board coordinators only**
- Please complete the short online questionnaire as *honestly as possible* of your knowledge of the subject discussed
- Complete each question by clicking on the answer you feel is most appropriate and/or providing a short response when asked
- You may start, stop, and restart the questionnaire
- This questionnaire should take approximately 20 minutes to complete

Thank you for your time.

**By entering your program's code and beginning the survey, you acknowledge that you have read this information and agree to participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.**

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#### Questionnaire

Does your program administer Restorative educational Mock Board experience(s)?

- a. Yes
- b. No

Please identify below which category best identifies your demographic status by checking the appropriate answer.

#### Demographics

1. What is your position title?
  - a. Chair or Director

- b. Clinic Coordinator or Supervisor
  - c. Faculty Member
  - d. Other, please identify your title
2. Are you a full or part-time employee?
- a. Part-time ( $\leq 20$  hours/week during the academic year)
  - b. Full-time ( $\geq 21$  hours/week during the academic year)
3. How many years have you been a dental hygiene educator?
- a. 1-5 years
  - b. 6-10 years
  - c. 11-15 years
  - d. 16-20 years
  - e. 21-25 years
  - f. 26-30 years
  - g. Over 30 years
4. What is the highest degree you have earned?
- a. Associate
  - b. Bachelor
  - c. Master
  - d. Doctoral
  - e. Other, please specify
5. How many years have you been coordinating restorative Mock Board examinations at the end of the 2013-2014 academic year?
- a. 1-5 years

- b. 6-10 years
  - c. 11-15 years
  - d. 16-20 years
  - e. 21-25 years
  - f. 26-30 years
  - g. Over 30 years
6. Have you ever observed a WREB Restorative Examination? If yes, how many examinations have you observed or participated?
- a. Yes, 1 examination
  - b. Yes, 2-3 examinations
  - c. Yes, more than three examinations
  - d. No, I have not observed or participated in an examination
7. Have you attended a WREB Educators Session sponsored by WREB personnel?  
If yes, how many WREB Educators Sessions have you attended?
- a. Yes, 1 WREB Educators Session
  - b. Yes, 2-3 WREB Educators Sessions
  - c. Yes, more than three WREB Educators Sessions
  - d. No, I have not attended a WREB Educators Session
8. Were you an examiner for the WREB 2014 Restorative Examination?
- a. Yes
  - b. No
9. How many faculty members at your dental hygiene program are WREB examiners?

<insert text box>

10. What degree do your entry-level students earn?

- a. Certificate
- b. Associate of Science
- c. Associate of Applied Science
- d. Other Associate degree, please specify
- e. Bachelor of Science
- f. Other Bachelor degree, please specify
- g. Other, please specify

Please identify below which criteria/definition you incorporated into your 2013-2014 academic year Restorative Examination Mock Board Experiences for your students by checking the appropriate answer.

**Examiner Calibration**

- 1. Are examiners calibrated on check-in procedure/criteria prior to the Mock Board examination?
  - a. Yes
  - b. No
- 2. Are Examiners calibrated using WREB grading criteria prior to the Mock Board examination?
  - a. Yes
  - b. No
- 3. Is the calibration conducted using WREB required dentoforms and restorations (amalgam and composite) placed in WREB required tooth preparations?

- a. Yes
  - b. No
4. Is the calibration conducted using WREB required restorative materials: amalgam and A4 or A4B composite shades or A1 flowable shade?
- a. Yes
  - b. No
5. Do the examiners calibrate using the WREB required instruments and materials: fine waxed dental floss, front surface #4 or #5 mouth mirror, UNC #12 periodontal probe, #2R/2L pigtail explorer?
- a. Yes
  - b. No

### **Course Evaluation**

1. Is (are) the completion of the Mock Board examination experience(s) a course requirement?
- a. Yes
  - b. No
2. What type of grade do the students earn for their Mock Board examination experience?
- a. Numerical grade
  - b. Pass/fail score ( $\geq 75$  = Pass and  $\leq 74$  = Fail)
  - c. No grade
  - d. Other, please specify

3. What percentage of the course final grade in a curriculum course is the Mock Board examination?
- a. None
  - b. 1-10%
  - c. 11-20%
  - d. 21-30%
  - e. 31-40%
  - f. 41-50%
  - g. More than 50%
  - h. Degree earned
4. Is the Mock Board examination “competency-based” indicating the student is successful or not successful in a course (e.g. Clinical Dental Hygiene, Capstone Course, or other)?
- a. Yes
  - b. No
  - c. Other, please specify
5. Is completion of course prerequisites required to participate in the Mock Board examination experience (e.g. certain number of Class II amalgam and composite restorations prior to exam and/or certain percentage earned on these restorations)?
- a. Yes, please explain the course prerequisite
  - b. No

### **Preliminary Criteria**



1. Are students required to attend a mandatory orientation session to review process and procedures prior to the Mock Board examination?
  - a. Yes
  - b. No
2. Do students receive and review a restorative assignment sheet and an instruction to candidate form similar to the WREB Restorative Assignment Sheet and the Instructions to Candidate Form prior to the Mock Board examination?
  - a. Yes
  - b. No
3. Are students assigned a Candidate number?
  - a. Yes
  - b. No
4. Are students kept anonymous from the examiners?
  - a. Yes
  - b. No
5. Does a faculty member fulfill the role of Chief Examiner to act as a liaison between the students and the examiners?
  - a. Yes
  - b. No

**Equipment and Materials**

1. Are examiners provided with WREB required instruments that are not the students (front surface #4 or #5 mouth mirror, UNC #12 periodontal probe, #2R/2L pigtail explorer)?

- a. Yes, examiners are supplied with their own WREB required instruments
- b. No, examiners and students share instruments

Are students:

- 2. Required to use WREB identified composite or flowable materials: A4 or A4B composite shades or A1 flowable shade?
  - a. Yes
  - b. No
- 3. Not permitted to use a surface sealer, flowable, or unfilled resin/glaze to the surface of the finished restoration?
  - a. Yes, students *are not* permitted to use a surface sealer, flowable, or unfilled resin/glaze
  - b. No, students *are* permitted to use a surface sealer, flowable, or unfilled resin/glaze
- 4. Held to a maximum score of two if an examiner determines a surface sealer, flowable, or unfilled resin/glaze was not permitted but used on the surface of the finished restoration?
  - a. Yes, students *are held* to a maximum score of two if the above materials are not permitted but were used
  - b. No, students *are not held* to a maximum score of two if the above materials are not permitted but were used
- 5. Required to use WREB identified equipment: restorative instruments, handpiece(s), metal or plastic air/water syringe tip(s), candidate protective eyewear, gloves, mask, amalgamators, curing light and shield?

- a. Yes
  - b. No
6. Not permitted to use T-mirrors?
- a. Yes, students *are not* allowed to use T-mirrors
  - b. No, students *are* allowed to use T-mirrors
7. Required to use the WREB Candidate Limitation of Liability and Indemnity Agreement or forms similar?
- a. Yes
  - b. No

**Dentoform Criteria**

Is the restorative Mock Board examination dentoform required to be/to have:

1. Either the Columbia 860 series or the Kilgore D85SDP200 or D95SDP200?
  - a. Yes
  - b. No
2. Full dentition of 28 or 32 teeth?
  - a. Yes
  - b. No
3. Only one Class II molar preparation with an interproximal contact in each quadrant?
  - a. Yes
  - b. No
4. All remaining teeth in the quadrant virgin (i.e. without sealants or restorative materials)?

- a. Yes
  - b. No
5. Prepared teeth and adjacent teeth that are anatomically correct and properly placed?
- a. Yes
  - b. No
6. Prepared teeth and adjacent teeth that are not mobile?
- a. Yes
  - b. No
7. Gingiva that is soft pink silicone and NOT transparent or semi-transparent?
- a. Yes
  - b. No

### **Preparations Criteria**

Do you require:

1. The use of four initial Class II preparations?
  - a. Yes
  - b. No
2. That the occlusal of the preparation must extend from the prepped interproximal to the furthestmost fossa and include the entire occlusal surface?
  - a. Yes
  - b. No
3. That the preparation is not less than three millimeters in width at the central fossa and the interproximal box?

- a. Yes
  - b. No
4. That the preparation is not less than two millimeters in depth from the cavosurface margin?
- a. Yes
  - b. No
5. That the floor of the preparation must be at or above the gingiva?
- a. Yes
  - b. No
6. That at least one maxillary and one mandibular preparation must be acceptable for examiner preparation assignment?
- a. Yes
  - b. No

### **Restorative Mock Board Examination Procedures Criteria**

Do you require/allow:

1. Students 25 minutes for operatory set-up?
  - a. Yes
  - b. No
2. That students position the dentoform on the rod post to mimic a natural treatment position?
  - a. Yes
  - b. No
3. A plastic cover is attached for amalgam scraps?

- a. Yes
  - b. No
4. The Chief Examiner or a person who acts as a liaison between the students and the examiners to verify the correct composite or flowable shade?
- a. Yes
  - b. No
5. Students to exit the testing area after the 25 minute set-up period?
- a. Yes
  - b. No
6. The use of a one point deduction for each minute your student continues working after the 25 minute set-up?
- a. Yes
  - b. No
7. One examiner to evaluate the dentoform and four preparations for qualifying criteria and assign one mandibular and one maxillary preparation for the restorative procedure on the Restorative Assignment form?
- a. Yes
  - b. No
8. A minimum of two examiners to validate for rejection reasons, such as non-qualifying criteria?
- a. Yes
  - b. No

9. The examiners to register the student as a “no show” if the dentoform does not meet the requirements?
- a. Yes
  - b. No
10. Students to resubmit a corrected dentoforms if the first submission do not meet the requirement?
- a. Yes
  - b. No
11. Time compensation for students who resubmit dentoforms?
- a. Yes, *time is* compensated for dentoform resubmission
  - b. No, *time is not* compensated for dentoform resubmission
12. The examiners register the student as a “no show” when a preparation does not meet the criteria and therefore cannot be assigned by an examiner?
- a. Yes
  - b. No
13. Students to resubmit new preparations if the first submissions do not meet the requirements?
- a. Yes
  - b. No
14. Time compensation for students who resubmit preparations ?
- a. Yes, *time is* compensated for dentoform resubmission
  - b. No, *time is not* compensated for dentoform resubmission

15. That the Chief Examiner or a person who acts as a liaison between the students and the examiners announces student reentry into the testing area?
- a. Yes
  - b. No
16. Students 1 ½ hours to complete the Mock Board examination?
- a. Yes
  - b. No
17. Students to remain in the testing area during the Mock Board examination unless they have completed the examination?
- a. Yes, students *are not* allowed to leave the clinic testing area unless they have completed the Mock Board examination
  - b. No, students *are* allowed to leave and return to the clinic testing area while taking the Mock Board examination
18. An examiner to reassign a new preparation on the opposite side of the same arch if a preparation breaks during the examination?
- a. Yes
  - b. No
19. Student time compensation for preparation breakage during the examination?
- a. Yes, *time is* compensated for preparation breakage during the examination
  - b. No, *time is not* compensated for preparation breakage during the examination



20. That the student registers as a “no show” and forfeits the Mock Board examination if the student’s preparation breaks and they choose to discontinue the examination?
- a. Yes
  - b. No
21. A time compensation for school equipment malfunction not resolved in five minutes?
- a. Yes
  - b. No
22. That the Chief Examiner or a person who acts as a liaison between the students and the examiners announces when five minutes are left in the Mock Board examination?
- a. Yes
  - b. No
23. That students exit the testing area after the allotted Mock Board examination time?
- a. Yes
  - b. No
24. The use of a one point deducted for each minute the student continues working after the 1 ½ hour examination time?
- a. Yes
  - b. No
25. That the dentoforms are taken to another area for grading?

- a. Yes
- b. No

26. A minimum of three examiners independently score restorations and evaluate adjacent gingiva and hard tissue?

- a. Yes
- b. No

27. Students to remain in the testing area for no more than 20 minutes for clean up?

- a. Yes, students are allowed *no more* than 20 minutes for clean-up
- b. No, students are allowed *more than* 20 minutes for clean-up

### **Restorative Mock Board Performance Grading Evaluation**

Is/Are:

1. There 100 points possible for the Mock Board examination?
  - a. Yes
  - b. No
2. A passing score 75 point or above?
  - a. Yes
  - b. No
3. There an automatic failure of the examination if the wrong tooth is restored?
  - a. Yes
  - b. No
4. There an automatic failure of the examination if the incorrect restorative material is placed in the tooth, for example a composite restoration is assigned but an amalgam restoration is placed?

- a. Yes
  - b. No
5. There an automatic failure of the examination if the natural treatment position of the dentoform is intentionally altered on the rod post (e.g. the dentoform is placed upside down on the rod post)?
- a. Yes
  - b. No
6. Three examiners used to independently grade the restorations?
- a. Yes
  - b. No
7. Each restoration divided into three categories and graded separately: occlusal, proximal, and margin?
- a. Yes
  - b. No
8. Examiners grading each category on a 0-5 scale according to WREB grading criteria rubric provided in the 2014 Restorative Examination Candidate Guide?  
*(Table provided in questionnaire, See Table X)*
- a. Yes
  - b. No
9. The score for each category based on the median score of the three examiners' scores given for each category?
- a. Yes
  - b. No

10. The two restorations graded separately and the average of the two scores used to determine the final grade?

- a. Yes
- b. No

11. The Raw Score conversion in the 2014 WREB Restorative Examination

Candidate Guide used to reach a final score:

<b>Raw Score</b>	<b>Points Received</b>
5.00	100.00
4.00-4.99	88.00-99.99
3.00-3.99	75.00-87.99
2.00-2.99	55.00-74.99
1.00-1.99	35.00-54.99
0.00-0.99	0-34.99

- a. Yes
- b. No

12. Five points deduction for each site of damage (trauma) to the hard tissue that is in excess of one millimeter?

- a. Yes
- b. No

13. Two examiners used to validate hard tissue damage (trauma)?

- a. Yes
- b. No

14. Five points deduction for each site of damage (trauma) to soft tissue in excess of three millimeters?

- a. Yes
- b. No

15. Two examiners used to validate hard tissue damage (trauma)?

- a. Yes
- b. No

### **Restorative Mock Board Post Examination Procedures**

1. Do students receive a written critique of their performance?

- a. Yes
- b. No

2. Do you have a review session with the entire class to discuss the students' overall strengths and weaknesses?

- a. Yes
- b. No

3. Do you review performance with every student on an individual basis?

- a. Yes
- b. No

4. Do you **only** review performance with students who do not pass?

- a. Yes
- b. No

5. For non-successful attempts, do you require students to complete a Mock Board examination experience until a passing score has been achieved?

- a. Yes
  - b. No
6. Do you provide remediation for those who are not successful on the Mock Board examination?
- a. Yes, please describe
  - b. No

### **Student Self-Assessment**

Student self-assessment is a learning experience through specific assessment and qualitative judgment based on student critical self-reflection (Billings & Halstead, 2009). Examples of student self-assessment include written presentations such as journals or blogs, oral presentations, expectation checklists, and self-monitoring rubrics.

4. Do you have your students self-assess their **experience** on the Mock Board examination (e.g. preparation selection, composite selection, time allocation, etc.) prior to receiving exam results?
- a. Yes
  - b. No
5. Do you have your students self-assess their **performance** on the Mock Board examination (e.g. Class II amalgam and composite restoration placement procedures) prior to receiving exam results?
- a. Yes
  - b. No
6. How do students complete their self-assessment of the Mock Board examination experience or performance?

- a. Written only
- b. Oral only
- c. Both written and oral
- d. N/A

### **Number of Restorative Mock Board Examination Experiences**

Do students:

- 3. Do your students participate in:
  - a. One restorative Mock Board examination throughout their education?
  - b. Two restorative Mock Board examinations throughout their education?
  - c. Three or more restorative Mock Board examinations throughout their education?
- 4. Please identify when (e.g., 4<sup>th</sup> semester in a 4 semester program)

<Insert Text Box>

### **Other Questions**

- 4. Do you incorporate other aspects into your program's restorative Mock Board examinations that are not mentioned above?
  - a. Yes, please describe
  - b. No
- 5. What would facilitate your inclusion of all WREB criteria into your program's restorative Mock Board examinations?
  - a. Already include all of WREB criteria
  - b. Do not include all criteria and would if: please explain

6. If there have been any changes made to your program's restorative Mock Board examinations in the past three years, what were the changes and what impact have the changes made on student performance on the WREB Restorative Examination?

### References

Billings, D. M., Halstead, J. A. (2009). *Teaching in nursing: A guide for faculty* (3<sup>rd</sup> ed.).

St. Louis, MO: Saunders Elsevier.

Western Regional Examining Board. (2014). *2014 Restorative examination candidate guide*. Retrieved from

[https://www.wreb.org/Candidates/Hygiene/hygienePDFs/WREB\\_2014\\_CAN\\_Guide\\_RES.pdf](https://www.wreb.org/Candidates/Hygiene/hygienePDFs/WREB_2014_CAN_Guide_RES.pdf)

### WREB Grading Criteria for question #8 under RE MB Performance Grading Evaluation

	5	4	3	2	1	0
<b>30% Occlusal</b>	Replicates proper anatomy (restoring harmonious form). Ridges and marginal ridge present and properly formed. Smooth surface, no pits or voids.	Slight variation of harmonious form. Major grooves formed and positioned correctly. Supplemental grooves may or may not be present. Fossae present. Ridge and marginal ridge present, but slight variation. Slight surface	Moderate variation of harmonious form. Anatomy adequate. Marginal ridge height has functional contour. Anatomy or marginal ridge can be corrected with minimal polishing and finishing. Moderate surface irregularities (pitting or	Anatomy inadequately carved and/or over/under carved. Marginal ridge contour/height improper. Pits and fossae improperly placed (would alter occlusion or cause food impaction). Any ridges, oblique and/or transverse, improperly placed. Critical surface irregularities or defects	Incorrect anatomy (would significantly alter function). Pits and fossae incorrectly placed. Incorrect marginal ridge contour/height > 1mm (would significantly impact function). Improper manipulation or trituration of material.	Gross lack of anatomy. Gross surface irregularities or defects and/or fracture of restoration.



		irregularities (pitting or voids).	voids).	(pitting or voids). Placement of glazing/unfilled resin over finished restoration.	Severe surface irregularities or defects (pitting, voids, and/or fractures). Uncured resin.	
<b>35% Proximal</b>	Replicates proper anatomy (restoring harmonious form). Optimal contact - will allow waxed floss to pass through contact with proper resistance . Smooth surface, no pits or voids.	Slight variation of proximal contour, shape, and/or position of contact area. Nearly optimal contact - will allow waxed floss to pass through contact with near proper resistance. Slight surface irregularities (pitting or voids).	Moderate variation of proximal contour, shape, and/or position of contact area. Gingival-occlusal embrasures not defined, but functional. Barely adequate contact, will allow waxed floss to pass through contact with slight resistance or moderately tight resistance (may shred waxed floss). Moderate surface irregularities (pitting or voids).	Critical variation of proximal contour, shape, and/or position of contact area. Improper contact - tight (may break waxed floss). Improper contact (open / light). Critical surface irregularities or defects (pitting or voids). Placement of glazing/unfilled resin over finished restoration.	Severe variation of proximal contour, shape, and/or position of contact area. Contact wrong shape or position. Incorrect contact - cannot get floss through contact. Open contact. (Visibly open). Improper manipulation or trituration of material. Severe surface irregularities or defects (pitting, voids, and/or fractures). Uncured resin.	Grossly inadequate proximal contour or contact position. Gross open contact. Gross surface irregularities or defects and/or fracture of restoration.
<b>35% marginal</b>	Minimal variation of cavosurface margin (+). No damage	Slight variation of cavosurface margin (+ or -). Slight scarring of tooth	Moderate variation of cavosurface margin + or - (can be corrected with minimal polishing and	Critical variation of cavosurface margin, open > .5mm; integrity compromised( not	Severe variation of cavosurface margin open >1 mm (not correctable). > 1mm excess - would	Gross variation of cavosurface margins. Open margins with gross excess or

	to hard tissue or slight scarring of tooth structure.	structure in (multiple areas).	finishing). Moderate scarring to tooth structure. Alters tooth structure without compromising normal tooth function or restoration.	correctable). 1mm excess - would compromise periodontal health. Critical damage to tooth structure affecting normal function or restoration. Placement of glazing/unfilled resin over finished restoration.	compromise periodontal health. Severe damage to tooth structure affecting normal function or restoration (multiple areas).	deficiency (multiple). Gross damage to tooth structure.
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**Appendix D Invitation Email Message to Dental Hygiene Program Directors**

Dear <Program Director name>,

You are invited to share your program's experiences with educational Mock Boards for research and dissemination purposes as this topic is an important aspect of entry-level dental hygiene education. My name is Vickie Martin, RDH, BFA and I am a graduate student at Idaho State University in the Master of Science degree program in Dental Hygiene.

As a dental hygiene educator, my research interests are related to the preparation students receive during their educational Mock Boards and whether the preparation is correlated to their performance on the "real" examinations. Therefore, the purpose of my thesis is to describe the characteristics of educational Mock Board experiences and determine if there is a relationship between Mock Boards and WREB examination scores and success rates. Your program has been selected to participate in this study because your students are eligible for all three WREB examinations: Dental Hygiene, Local Anesthesia, and Restorative. Currently there are 22 programs meeting this criterion.

To safeguard participant confidentiality and anonymity, a code has been assigned to your program. No identifying information will be revealed in the study and the results will only be provided in aggregate form when presented at national meetings and written in a manuscript.

As director of a dental hygiene program you will be asked to do the following:

1. Forward an email message inviting each of the **2013-2014 academic year** Mock Board Coordinators for your Dental Hygiene, Local Anesthesia, and Restorative Mock Board examinations. The invitational message includes a study overview, informed consent explanation of participation risks and benefits, a de-

identification code specific to your program, and links to the three specific questionnaires in Qualtrics®, an online survey tool. Each questionnaire should be able to be completed in 20 minutes or less.

- If you prefer, please email me your 2013-2014 academic year Mock Board Coordinators' email addresses and I can send the invitational email directly to your Mock Board Coordinators, copying you and my thesis adviser on the email.
- Should two faculty members or more administer one Mock Board experience, please forward the message to only **one** faculty member.
- If one faculty member acts as Coordinator for two or more Mock Boards, such as Clinical Dental Hygiene Coordinator **and** Local Anesthesia Coordinator, please ask that faculty member to participate all questionnaires they coordinate.

2. Read, understand, and sign the attached *Permission to Obtain WREB Examination Data* form. This form will permit me to obtain your program's 2014 WREB average test results directly from the WREB Office. Data from the WREB will be de-identified with a code number used in place of your program's name. The WREB has agreed to provide the test results as aggregated data and **will not provide any individual student scores or student identifiers**.

- Should you choose to sign the *Permission to Obtain WREB Examination Data* form, return it to me via email. Signing the permission form will indicate your willingness for me to compare Mock Board characteristics with 2014 WREB examination statistical data from your program.

- Should you choose to *not* sign the *Permission to Obtain WREB Examination Data* form, please forward my email message to the Mock Board Coordinators for each of the WREB examinations. The data obtained from the survey will be vital for describing Mock Board examination characteristics.

3. As needed, distribute two email reminders to the 2013-2014 academic year Mock Board Coordinators after one week and two weeks of the survey being open if your prefer to be the contact person for my correspondence.

Thank you for taking the time to assist me in my educational endeavors. If you have any questions regarding this study or would like a copy of the results, please do not hesitate to contact me or my thesis advisor Dr. Ellen Rogo at 208-282-3017 or [rogoelle@isu.edu](mailto:rogoelle@isu.edu). Either of us can be contacted for the results of this study.

Sincerely,

Vickie Martin (907-223-6257 or [martvic3@isu.edu](mailto:martvic3@isu.edu))

**Appendix E Permission to Obtain WREB Examination Data Form**

### Permission to Obtain WREB Examination Data form

\_\_\_\_\_, an educational institution that is authorized to receive WREB examination data for matriculated students, gives permission to WREB to release the 2014 Dental Hygiene, Local Anesthesia and Restorative Examination average program test results as aggregated data to the primary investigator, Victoria Martin, RDH, BFA, graduate student in the Master of Science Dental Hygiene program at Idaho State University. The data will be used to compare to the three dental hygiene program survey questionnaires regarding dental hygiene, local anesthesia, and restorative educational Mock Board experiences. The intent of this study is to describe the characteristics of educational Mock Boards administered by entry-level dental hygiene programs and the relationship of the examination experiences on the average scores or success rates for the Western Regional Examining Board 2014 Dental Hygiene, Local Anesthesia, and Restorative Examinations. **No individual student scores will be provided by WREB.**

The primary investigator and two dental hygiene thesis committee members will protect the confidential nature of the data and ensure that no identifying information in the data (i.e., institution name) will be used. Reported results will not include disclosure of any identifying information nor will results be reported in a context that could lead to indirect identification.

**Please return the signed form to Vickie Martin at [martvic3@isu.edu](mailto:martvic3@isu.edu)**

Signature:

Date:

Name:

Title:

**This form should be signed by the appropriate authorized institutional representative.**



**Appendix F Invitation Email Message to the Mock Board Coordinators**

Subject: Invitation to participate in Mock Board Research Study

Dear <Program Director name>,

Please forward this email to your 2014 dental hygiene, local anesthesia, and restorative Mock Board Coordinators.

Sincerely,

Vickie Martin (907-223-6257 or [martvic3@isu.edu](mailto:martvic3@isu.edu))

Dear Mock Board Coordinator,

You are invited to share your program's experiences with educational Mock Boards for research and dissemination purposes, as this topic is an important aspect of entry-level dental hygiene education. My name is Vickie Martin, RDH, BFA and I am a graduate student at Idaho State University in the Master of Science degree program in Dental Hygiene.

As a dental hygiene educator, my research interests are related to the preparation students receive during their educational Mock Boards and whether the preparation is correlated to their performance on the "real" examinations. Therefore, the purpose of my thesis is to describe the characteristics of educational Mock Board experiences and determine if there is a relationship between mock boards and WREB licensure examination scores and success rates. Your program has been selected to participate in this study because your students are eligible for all three WREB examinations: Dental Hygiene, Local Anesthesia, and Restorative. Currently there are 22 programs meeting this criterion.

To ensure participant confidentiality and anonymity, a code has been assigned to your program. No identifying information will be revealed in the study and the results

will only be provided in aggregate form when presented at national meetings and written in a manuscript. Your participation is voluntary and you are free to withdraw your participation from this study at any time. The decision not to participate will not affect your or your program's relationship with Idaho State University.

If you consent to participate, you will be asked to do the following:

1. Access all Mock Board Questionnaires with which you are familiar (Clinical Dental Hygiene, Local Anesthesia and/or Restorative Questionnaires) using the link provided in this message.
2. Enter your program's code number on the first screen.
3. Complete an electronic questionnaire in Qualtrics®, which should require approximately 20 minutes of your time. You can start and stop the questionnaire multiple times.
4. Complete the questions honestly and do not assume there is a "correct" answer.

The dissemination of the findings related to Mock Board characteristics might assist educators in structuring educational Mock Board experiences to more effectively prepare their students. Your participation in this much needed research is greatly appreciated. Thank you for taking the time to assist me in my educational endeavors.

If you have any questions regarding this study, please do not hesitate to contact me or my thesis advisor Dr. Ellen Rogo at 208-282-3017 or [rogoelle@isu.edu](mailto:rogoelle@isu.edu). Either of us can be contacted for the results of this study.

Sincerely,

Vickie Martin (907-223-6257 or [martvic3@isu.edu](mailto:martvic3@isu.edu))

**Please provide us with your feedback no later than February 6<sup>th</sup>, 2015**

**Your Dental Hygiene Program's De-Identification Code: \_\_\_\_\_**

**Please click on the survey link below. You can copy and paste your program code in the space provided on the first screen of the questionnaire**

<Dental Hygiene Questionnaire Link>

<Local Anesthesia Questionnaire Link>

<Restorative Questionnaire Link>

**Appendix G Email Message from WREB Granting Permission to Ask Dental  
Hygiene Programs to Release Examination Data to Vickie Martin for Thesis**

Sharon Osborn Popp <sosbornpopp@wreb.org>

6/24/13

to me

Hi, Vickie.

I just wanted to let you know that WREB's board of directors approved your new topic ☐.

It is official and recorded, after the most recent teleconference.

I hope all is well!

-Sharon

Sharon E. Osborn Popp, Ph.D.

Testing Specialist/Psychometrician

Western Regional Examining Board

23460 N 19th Ave., Suite 210

Phoenix, AZ 85027

Phone: [623-209-5420](tel:623-209-5420)

Fax: [602-371-8131](tel:602-371-8131)

**Appendix H Reminder email message to Mock Board Coordinators after the  
questionnaire online site is open for one week**

Subject: Invitation to participate in Mock Board Research Study- reminder

Dear <Program Director>,

Please forward this email to your 2014 dental hygiene, local anesthesia, and restorative Mock Board Coordinators.

Sincerely,

Vickie Martin (907-223-6257 or [martvic3@isu.edu](mailto:martvic3@isu.edu))

Hello again. This e-mail is a follow-up to one previously sent last week to request your participation in an online questionnaire about the 2013-2014 academic year educational Mock Board experiences in which the students completed. The link to the questionnaire in Qualtrics® is provided at the bottom of this e-mail message. If you have already participated in the online questionnaire, please disregard this e-mail.

The questionnaire will take about approximately 20 minutes of your time to complete. You can stop and return to the questionnaire as many times as necessary during the week period the questionnaire is open. There are no risks associated with participating in this study and non -participation will not affect your relationship at/to Idaho State University.

- To ensure participant confidentiality and anonymity, a code has been assigned to your program. No identifying information will be revealed in the study and the results will be only provided in aggregate forms.
- Before participating in the survey you will be required to enter your program's de-identification code. By entering your program's code and beginning the survey, you acknowledge that you have read this information and agree to



participate in this research, with the knowledge that you are free to withdraw your participation at any time without penalty.

You are one of **only** 66 participants; please consider taking part in this questionnaire.

If you have any questions regarding this research I may be reached online at [martvic3@isu.edu](mailto:martvic3@isu.edu). You may also contact my thesis advisor Dr. Ellen Rogo at [rogoelle@isu.edu](mailto:rogoelle@isu.edu)

I sincerely thank you for your consideration to participate in this important research.

Vickie Martin

**Please provide us with your feedback no later than **February 6<sup>th</sup>, 2015****

**Your Dental Hygiene Program's De-Identification Code: \_\_\_\_**

**Please click on the mock board survey link you coordinated. You can copy and paste your program code in the space provided on the first screen of the questionnaire**

<Dental Hygiene Questionnaire Link>

<Local Anesthesia Questionnaire Link>

<Restorative Questionnaire Link>

**Appendix I Reminder Email Message to Mock Board Coordinators after the  
Questionnaire Online Site Is Open for Two Weeks**

Subject: Invitation to participate in Mock Board Research Study- Final Reminder

Dear <Program Director>,

Could you please forward this final reminder to your 2014 dental hygiene, local anesthesia, and restorative Mock Board Coordinators? I truly appreciate your program's participation with my thesis project.

Sincerely,

Vickie Martin (907-223-6257 or [martvic3@isu.edu](mailto:martvic3@isu.edu))

Dear Mock Board Coordinator,

I am a graduate student at Idaho State University and I am contacting you as a follow-up e-mail about participating in an online questionnaire about educational Mock Board characteristics. If you have already participated in the online questionnaire, please disregard this e-mail.

If you have not yet completed the questionnaire please consider participating in this very important research.

- You will only be asked questions about your knowledge of coordinating the 2013-2014 academic year educational Mock Board student experiences.
- **Your** contribution to this survey is important and could help create an awareness of specific characteristics of Mock Board examination experiences that affect student success with WREB examinations. These characteristics might assist educators in structuring educational Mock Board experiences to more effectively prepare their students.
- Your participation is voluntary and confidentiality is assured. Non-participation will not affect your relationship at/to Idaho State University.

If you have any questions regarding this research I may be reached online at [martvic3@isu.edu](mailto:martvic3@isu.edu) . You may also contact my thesis advisor Dr. Ellen Rogo at [rogoelle@isu.edu](mailto:rogoelle@isu.edu)

Sincere thanks

Vickie Martin

**Please provide us with your feedback no later than February 13<sup>th</sup>, 2015**

**Your Dental Hygiene Program's De-Identification Code: 0000**

**Please click on all the mock board survey links you coordinated. You can copy and paste your program code in the space provided on the first screen of the questionnaire**

<[Dental Hygiene Questionnaire Link](#)>

<[Local Anesthesia Questionnaire Link](#)>

<[Restorative Questionnaire Link](#)>

**Appendix J Program Director Email Message Reminder to Sign the WREB  
Permission Form**

Subject: Thank You and a final request

Dear Program Directors,

I would like to thank you for your program's participation with my thesis project as well as for your time with my educational endeavors.

As you know, the purpose of my thesis is to describe the characteristics of educational Mock Board experiences and determine if there is a relationship between Mock Boards and WREB examination scores and success rates. In order to collect WREB examination data, I am asking you to sign the attached *Permission to Obtain WREB Examination Data* form. This form will permit me to obtain your program's 2014 WREB average test results directly from the WREB Office.

Data from the WREB will be de-identified with a code number used in place of your program's name. The WREB has agreed to provide the test results as aggregated data and **will not provide any individual student scores or student identifiers**.

Reported results will not include disclosure of any identifying information nor will results be reported in a context that could lead to indirect identification.

As always, if you have any questions regarding this study or would like a copy of the results, please do not hesitate to contact me or my thesis advisor Dr. Ellen Rogo at 208-282-3017 or [rogoelle@isu.edu](mailto:rogoelle@isu.edu). Either of us can be contacted for the results of this study.

Sincerely,

Vickie (907-223-6257 or [martvic3@isu.edu](mailto:martvic3@isu.edu))

## **Appendix K JDE Author Guidelines**

JDE submission requirements: <http://www.jdentaled.org/site/misc/ifora.xhtml>

- 3,500 words maximum, excluding the abstract, illustrations and references
- A maximum of six figures and tables can be submitted
- References should not exceed 50

**Document Format.** Create the documents on pages with margins of at least 1 inch (25 mm) and left justified with paragraphs indented with the tab key, not the space bar. Use double-spacing throughout and number the pages consecutively. Do not embed tables and figures in the body of the text but place them after the references; include callouts for each table or figure in the text (e.g., see Table 1). Unless tables vary significantly in size, include all in one document. If any figures are large files, submit them as separate documents.

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**Text.** Follow American (rather than British) English spelling and punctuation style. Spell out numbers from one to ninety-nine, with the exception of percentages, fractions, equations, numbered lists and Likert scale numbers. The body of the manuscript should be divided into sections preceded by appropriate subheads. Major subheads should be typed in capital letters at the left-hand margin. Secondary subheads should appear at the left-hand margin, be typed in upper and lower case and be boldfaced. Tertiary subheads

should be typed in upper and lower case and be underlined. For authors whose first language is not English, please use a medical writer or a native English-speaking colleague to edit the manuscript prior to final submission. Manuscripts will be rejected prior to peer review if there are numerous usage or grammatical errors.

**Introduction:** Provide a succinct description of the study's background and significance with references to the appropriate published literature. Detailed literature review/discussion should be reserved for the discussion section. Include a short paragraph outlining the aims of the study.

**Materials and Methods:** A statement that the study has been approved or exempted from oversight by a committee that reviews, approves and monitors studies involving human subjects must be provided at the beginning of this section, along with the IRB protocol number.

In this section, provide descriptions of the study design, curriculum design, subjects, procedures and materials used, as well as a description of and rationale for the statistical analysis. If the design of the study is novel, enough detail should be given for other investigators to reproduce the study. References should be given to proprietary information.

**Results:** The results should be presented in a logical and systematic manner with appropriate reference to tables and figures. Tables and figures should be chosen to illustrate major themes/points without duplicating information available in the text

**Discussion:** This section should focus on the main findings in the context of the aims of the study and the published literature. The authors should avoid an extensive review of the literature and focus instead on how the study's findings agree or disagree with the

hypotheses addressed and what is known about the subject from other studies. A reflection on new information gained, new hypotheses and limitations of the study should be included, as well as guidance for future research.

**Conclusion:** The article should end with a short paragraph describing the conclusions derived from the findings and implications of the study for dental education.

**References.** Number references consecutively in the order in which they are first mentioned in the text. Each source should have one number, so *be careful not to repeat sources in the reference list*. Identify references by Arabic numerals, and place them in the text as superscript numerals within or at the end of the sentence. Do not enclose the numerals in parentheses, and be sure to follow American rather than British or European style conventions (e.g., the reference number follows rather than precedes commas and periods). Two important reminders: 1) references should not be linked to their numbers as footnotes or endnotes and 2) references to tables and figures should appear as a source note with the table/figure, not numbered consecutively with the references for the article.

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**Title Page of Manuscript**

THE RELATIONSHIP BETWEEN EDUCATIONAL MOCK BOARDS AND  
CLINICAL BOARD EXAMINATIONS

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### Manuscript Abstract

#### THE RELATIONSHIP BETWEEN EDUCATIONAL MOCK BOARDS AND CLINICAL BOARD EXAMINATIONS

**Purpose.** This study described the characteristics of the 2013-2014 dental hygiene, local anesthesia, and restorative educational Mock Board (MB) experiences. Also, it explored relationships between these characteristics and dental hygiene programs' Western Regional Examining Board (WREB) 2013-2014 candidate performance outcomes.

**Methods.** Twenty-three directors were contacted whose dental hygiene programs met the inclusion criteria. Fifteen program directors consented to participate. These directors disseminated the dental hygiene, local anesthesia, and restorative online self-designed questionnaires to the appropriate MB coordinators after validity and reliability were established. Thirteen of the fifteen directors gave permission for the programs' WREB results to be used. The coordinators provided data about MB characteristics. Scores calculated from responses were compared to candidate performance on the corresponding WREB examination. Descriptive statistics of frequencies and percentages were used to identify common MB characteristics across programs. Pearson Product-Moment Correlation Coefficient, Point Biserial Correlation, and Chi-Square analysis were used to investigate relationships between characteristics and WREB candidate performance outcomes.

**Results.** Thirty-three questionnaires were completed by MB coordinators for a 73.3% response rate. Common characteristics included MBs as a course requirements, faculty written critiques, and student review sessions. Significant relationships were found

between candidate performance outcomes and (1) MB intensity scores, (2) examiner calibration scores, and (3) multiple experiences.

**Conclusion.** Most dental hygiene programs recognize the need for optimal student preparation for clinical board examinations. This study provides fundamental knowledge into MB characteristics that might assist educators in facilitating experiences to more effectively prepare students for these high stakes examinations.

**Key Words**

Dental Hygienist/education

Educational Measurement/method

Faculty, Dental

Licensure, Dental

Program Evaluation

Questionnaire

## **The Relationship Between Educational Mock Boards and Clinical Board Examinations**

### **INTRODUCTION**

Clinical board examinations required for state licensure are intended to evaluate specific criteria differentiating between adequate and inadequate performance in areas of critical competencies.<sup>1</sup> The examinations draw inferences about the candidate's abilities, providing a clinical assessment for state licensure entities to use in making valid licensure decisions.<sup>2</sup> Clinical board examinations are considered high-stakes examinations because the outcomes have potentially serious consequences.<sup>3-7</sup> Nonpassing scores on these examinations suggest that dental hygiene students have not attained the skills necessary for safe, entry-level practice. As a result, dental hygiene educational programs often use student performance on board examinations to assess the effectiveness of program curricula.<sup>8-10</sup> However, unsuccessful attempts might not be a result of programming curricula or a candidate's clinical ability, but rather a result of student unpreparedness for the examination criteria and environment.<sup>4, 11</sup>

Most dental hygiene educational programs administer Mock Board (MB) examination experiences for graduating students.<sup>11</sup> According to testing theory, if a student performs well on an examination, the student also should perform well on other indicators of the same construct.<sup>9</sup> Practicing procedures in a format similar to a board examination should have a positive influence on the examination outcome because this process introduces students to the procedures and testing conditions encountered during the examinations.<sup>8,11</sup> Accordingly, educational MB experiences in dental and dental

hygiene programs are common practice; however, research about MBs and their effectiveness is limited.

A 2002 study conducted by Jessee investigated educational MB experiences and the influence on dental licensure examinations.<sup>11</sup> The study found no single aspect or any particular format of a MB had a statistically significant effect on the outcome of board examinations.<sup>11</sup> However, in a 2004 study that compared the University of Florida College of Dentistry students' performance on MBs with performance on the Florida Dental Licensure Board Examination, Stewart, Bates, and Smith found two out of seven aspects of the educational MB had statistically significant predictability on the Licensure Examination: patient-based class II amalgam and dentofixed prosthodontic procedure.<sup>10</sup> The researchers surmised that the positive predictability between the two MB procedures and success on the licensure examination might be due to the universally and well established criteria of the two procedures among teachers, students, and board examiners and that these criteria were uniformly applied and reinforced during the MB experiences.<sup>10</sup>

Research on the use and effectiveness of educational MBs in dental hygiene education is limited to comparative studies between MB experiences and the written Dental Hygiene National Board Examination (DHNBE). In a 2000 study by Edenfield and Hansen, only a small effect was found where success on the Joint Commission on National Dental Examinations (JCNDE) Dental Hygiene MB predicted success on the DHNBE.<sup>12</sup> However, a study conducted by Hamerslough revealed a statistically significant relationship between the MB experience and success on the DHNBE.<sup>8</sup> Similarly, Dadian, et al. investigated the effectiveness of the JCNDE Dental Hygiene MB



as a tool for preparing students for the DHNBE.<sup>13</sup> The researchers found the JCNDE MB had a statistically significant effect on DHNBE preparation because it helped students gain familiarity to question formats and the overall exam experience.<sup>13</sup>

MB experiences are considered to be integral to student evaluation and readiness for clinical board examinations.<sup>11</sup> Differences in program MB characteristics, however, might relate to subsequent board examination scores and success rates. If dental hygiene educational programs rely on MB experiences as integral components of student evaluation and readiness for licensure examinations, then there is a need for current research to determine which characteristics are critical. This study was designed to address one research question inquiring about common characteristics of educational dental hygiene, local anesthesia, and restorative MB experiences. Also, hypotheses were tested to determine if there was a relationship between Western Regional Examining Board (WREB) candidate performance outcomes and five specific characteristics: (1) MB intensity scores, (2) remediation, (3) student self-assessment, (4) number of MB experiences, and (5) examiner calibration.

## MATERIALS AND METHODS

This study was reviewed by Idaho State University's Institutional Review Board and exempted from oversight because the protocol did not involve human subjects. Three questionnaires were developed to acquire information about dental hygiene program educational MB experiences related to the WREB dental hygiene, local anesthesia, and restorative examinations (DHE, LAE, RE). Each questionnaire was divided into categories that inquired about characteristics specific to the MB experiences. The questionnaires also captured demographic information regarding MB coordinators

including academic rank, education, and experience as an academician. The types of items used were forced-choice questions with categorical responses and open-ended questions. Six dental hygiene professionals who had expertise in survey construction and research methods assessed items for content validity. For items receiving a content validity index below 0.80, the questions were revised or deleted.<sup>14</sup> Each revised questionnaire was administered to a panel of four members to establish instrument reliability. The panel was composed of current or past educators with MB administration experience who did not meet the inclusion criterion. A 0.80 agreement level was established by test-retest reliability for each question; when a lower agreement rate was reached, the question was revised or deleted. The Intraclass Correlation for the dental hygiene MB questionnaire was 0.98, the local anesthesia MB was 0.88 and the restorative MB was 0.88; thereby, establishing sufficient reliability of each questionnaire.

The sample population included faculty members who were responsible for coordinating dental hygiene, local anesthesia, and restorative MBs from CODA-accredited dental hygiene programs whose students participated in all three WREB examinations. Twenty-three programs were identified as meeting the criteria: Alaska (n= two), Idaho (n= three), Oregon (n= eight), and Washington (n= ten). Program directors were identified from the entry-level dental hygiene program information published by the ADHA.<sup>15</sup> A cover letter was sent electronically to the program directors outlining the purpose of this study with a request to forward an introductory e-mail to faculty members responsible for coordinating the 2013-2014 MB experiences. Also included was a release form to give the investigators permission to receive the program's 2014 WREB examination performance outcomes.

The introductory e-mail correspondence to the MB coordinators included an overview of the study, informed consent explanation of participation risks and benefits, a program de-identification code number, and a link to access the corresponding MB questionnaire. The data were collected by Qualtrics®, an online survey platform. The first screen of the questionnaire was an introductory page with instructions and a place for participants to enter their program code. Participation was voluntary and consent was assumed based upon the return of the completed survey as per the consent statement. Participants were sent weekly reminders during the three-week data collection period.

Descriptive variables addressed in each questionnaire related to WREB criteria, evaluation of the MB within a course, post MB procedures including remediation, student self-assessment, number of MB experiences, and examiner calibration. The variables of remediation and student self-assessment were considered dichotomous with either an affirmative response (AR) or negative response. The number of MB experiences were categorized as one, or more than one experience. The variables of remediation, student self-assessment, and number of experiences were studied in relationship to the candidate performance outcomes on the WREB 2014 DHE, LAE, and RE. In addition, the WREB examination criteria were used to calculate an intensity score to determine how closely the MB experience aligned with the WREB criteria. Finally, an examiner calibration score was computed to ascertain the quality of procedures to establish a standardized approach to the MB. The intensity scores and the examiner calibration scores also were analyzed in relationship to WREB candidate performance outcomes.

Intensity scores for each MB examination were determined for each program based on the number of ARs to the questionnaire criteria taken from the WREB online

Candidate Guides. The intensity score was computed as a percentage by dividing the number of ARs by the total number of criteria. The potential range of intensity scores was 0-100%. Examiner calibration scores for each examination were determined for each program based on the number of ARs to the questions relating to these procedures. The examiner calibration score was computed as a percentage by dividing the number of ARs by the total number of relevant questions. The potential range of examiner calibration scores was 0-100%.

Candidate performance outcomes consisted of participating program's candidate passing examination scores and pass/fail outcomes. The dental hygiene and restorative WREB examinations were based on one hundred points possible and candidates receiving a score of seventy-five or above were successful. The local anesthesia examination was graded on a pass/fail basis; therefore, only pass or fail was included as the performance outcome. Each program's candidate pass/fail outcomes for all three examinations were computed by summing the number of candidates who passed the examination and dividing by the total number of candidates who completed the examination.

Descriptive statistics, i.e., question response frequencies and percentages, were used to identify common MB characteristics across programs. The statistical analysis employed to assess relationships between candidate performance outcomes and intensity scores and examiner calibration scores were correlation coefficients, i.e., the Pearson Product-Moment Correlation for interval-level data and the Point Biserial Correlation for the dichotomous variable of examination success (Pass/Fail). Cronbach's alpha estimates of internal consistency reliability were calculated on intensity score and examiner

calibration score scales. Chi-Square tests for independence were computed to assess the relationship between performance outcomes and remediation, student self-assessment, and number of MB experiences. The level for statistical significance was set at 0.05.

## RESULTS

Fifteen of the eligible twenty-three dental hygiene programs participated. Thirteen program directors from the fifteen participating programs consented to have WREB provide test result data to the investigator for analysis. MB coordinators completed thirty-three of forty-five possible questionnaires for a 73.3% response rate. The number of questionnaires returned differed by examination; dental hygiene questionnaire n= fourteen (93.3%), local anesthesia questionnaire n= eleven (73.3%), and restorative questionnaire n= eight (53.3%).

Two questionnaire items inquired about program characteristics. Most programs offered an Associate of Applied Science degree (53.3%, n = eight), 33.3% (n = five) awarded a Bachelor of Science degree, and 13.3% (n = two) offered an Associate of Science degree. The majority of the programs (66.7%, n = twenty-two) did not have faculty members who were WREB examiners. Eight items asked questions about coordinator characteristics (see Table 1). The majority of the respondents were employed full-time (78.8%, n= twenty-six). The largest percentage of dental hygiene examination coordinators held a clinic coordinator position (42.9%, n= six) and had earned a master's degree (71.4%, n = ten). Half of the dental hygiene coordinators taught six to ten years (n = seven) and had coordinated a MB between one and five years (57.1%, n = eight). However, for the local anesthesia examination and the restorative examination, the coordinators held a faculty member position (63.6%, n = seven and 62.5%, n= five,

respectively) and possessed a bachelor's degree (45.5%, n = five and 50.0%, n = four, respectively). One half of the restorative examination coordinators (n = four) had one to five years educator experience and 87.5% (n = seven) had one to five years experience coordinating restorative MBs. Local anesthesia coordinators represented the widest variance in years of educator experience and the least variance in years as a MB coordinator. The majority of coordinators (93.9%, n = thirty-one) were not WREB examiners. Most of the coordinators had observed at least one WREB clinical examination (87.8%, n = twenty-six) and attended a minimum of one Educator Form sponsored by WREB personnel (81.8%, n = twenty-seven).

### **Characteristics of Educational MB Experiences**

Questionnaires included items about the characteristics adhering to WREB examination criteria and procedures (see Table 2). Common categories for each of the three questionnaires included preliminary criteria, equipment and materials, procedure criteria, and performance grading evaluation. However, items within each category differed according to the examination based on the WREB requirements published in the online Candidate Guides. Also, each experience had unique categories and characteristics applied only to that examination. For instance, the dental hygiene examination questionnaire included a category about oral conditions and the restorative examination questionnaire included a category about dentoform criteria. The dental hygiene adherence to WREB criteria fell below 50.0% in five out of seven categories. For local anesthesia, two out of five categories fell below 50.0% and three out of five restorative categories fell below 50.0% WREB criteria adherence.

A section of each of the three questionnaires was devoted to the evaluation of the MB within a course (see Table 3). The coordinators were asked if the examination was competency-based, indicating the student was successful in a course such as a Capstone Course. Only 14.3% (n = 1) of the restorative examination coordinators as opposed to a larger percentage of both the dental hygiene and local anesthesia coordinators (42.9%, n = six and 50.0%, n = five, respectively) responded in the affirmative. The majority of all the coordinators reported that the completion of a MB experience was a course requirement. However, less than half of the coordinators for each MB reported completion of course prerequisites as a requirement to participate in the MB examination. Half (n = five) of the local anesthesia coordinators indicated that the MB examination was not part of a course final grade. Although smaller percentages, both the dental hygiene (21.4%, n = three) and restorative (14.3%, n = one) coordinators also indicated the MB was not part of a course final grade. A greater proportion of dental hygiene and local anesthesia examination coordinators (78.6%, n = eleven and 63.6%, n = seven, respectively) than the restorative coordinators (28.6%, n = two) reported assigning a grade to the MB experience similar to the corresponding WREB examination score, such as a numerical percentage or pass/fail determination.

The coordinators also responded to questions regarding post examination procedures, such as student review sessions, remediation, and student self-assessment, as well as number of experiences and examiner calibration (see Table 3). Most coordinators (87.9%, n = twenty-nine) provided students with a written critique of performance. The majority of dental hygiene examination coordinators provided class review sessions (71.4%, n = ten) as well as individual student review sessions (69.2%, n = nine). The

local anesthesia and restorative examination coordinators utilized individual student review sessions (81.8%, n = nine and 62.5%, n = five, respectively) more often than class review sessions (45.5%, n = five and 50.0%, n = four, respectively). All the local anesthesia examination coordinators required students to repeat the experience until a passing score was earned, whereas half of the dental hygiene and restorative examination coordinators (n = seven and n = four, respectively) required students to complete the MB until a passing score was achieved.

The local anesthesia examination coordinators were more likely to provide remediation (90.9%, n = ten) than the dental hygiene and restorative MB coordinators (64.3%, n = nine and 62.5%, n = five, respectively). When coordinators responded in the affirmative to providing remediation, they were asked to specify their response. Of the coordinators who responded to this request (n = twenty-two), 77.3% (n = seventeen) stated they provided individualized one-on-one instruction related to specified weaknesses or deficiencies. Not all coordinators indicated remediation as a requirement. However, the coordinators who indicated required remediation combined the remediation with multiple MB experiences and the final course grade. For example, one coordinator commented “Clinical remediation with a patient is required for non-successful attempts. If a student is not successful after 3 attempts [the student] received a 5% deduction from the final grade.” Another coordinator replied that he/she include student self-assessment after remediation; “In addition, the student completes a ‘mock board reflection’ form, in which he or she formally reflects on what was learned from the remediation experience. Once all tasks are completed and documents submitted, the student receives a 75/100, which is a passing score.”



The three questionnaires inquired about student self-assessments (see Table 3). Questions pertained to self-assessment *experience*, (e.g., patient selection, preparation, and time allocation) and self-assessment *performance*, (e.g., patient management, injection technique, and restoration placement procedures) as well as inquired if the self-assessments were written or oral. The majority of dental hygiene coordinators (64.3%, n = nine) indicated using student self-assessments. Within this group, 42.9% (n = six) utilize student self-assessment of the *experience* versus self-assessment of the *performance* (28.6%, n = four) and 42.9% (n = six) preferred a written student self-assessment. Similarly, 62.5% (n = five) of the restorative coordinators indicated using student self-assessments. However, restorative respondents were prone to utilize student *performance* self-assessments (50.0%, n = four) versus the *experience* self-assessments (12.5%, n = one) and were similar in preference between written assessments (25.0%, n = two) oral self-assessments (37.5%, n = three). Local anesthesia coordinators were less inclined to incorporate any student self-assessments (54.5%, n = six).

Each MB experience differed in the number of examinations the programs provided for the students (see Table 3). The majority of the dental hygiene coordinators (57.1%, n = eight) indicated administering only one experience, whereas 50.0% (n = four) of the restorative coordinators indicated three or more experiences. In an open-ended question, coordinators were asked to identify when they provided the experiences, e.g., 4th semester in a 4 semester program. Generally, a MB was administered during the last semester or last quarter for all three examinations; dental hygiene 92.9% (n = thirteen), local anesthesia 54.5% (n = six), and restorative 50.0% (n = four). Other

responses included two experiences over two quarters and three to four experiences in three quarters.

All of examiner calibration characteristics for all three MBs had a 75% or higher AR rate with the exception of two characteristics (see Table 3). First, only four dental hygiene examination coordinators (28.6%) reported conducting the calibration on dentoforms. Second, four local anesthesia examination coordinators (40.0%) reported calibration in a clinical setting with patients.

Lastly, three open-ended questions were included on each of the three questionnaires. The first question, which had the fewest responses, inquired about any aspects incorporated in the MB not mentioned in the questionnaire. One dental hygiene coordinator responded the evaluation also graded the students on "...how well they follow the process, correct paperwork, instruments, etc." A restorative coordinator commented that the program "...uses [their] own grade sheets in addition to WREB grade format." The local anesthesia coordinators did not provide any responses.

The second open-ended question explored reasons coordinators did not include all WREB criteria into the MB examination. Two themes dominated the responses: finding qualified patients, and constraints regarding staffing issues and time. Dental hygiene coordinators commented students find it difficult to locate board-qualifying patients and, therefore, exceptions were allowed so every student experienced the examination process. One coordinator said "We cannot use board quality patients as our students struggle to find qualifying patients..." Others commented that they "...allow a little more [periodontal] involvement but only if they could not find another patient" and "...will accept calculus in a pocket deeper than [WREB] criterion allows, avoiding having to

reject the patient ..." However, one coordinator made procedural modifications for criteria leniency, for example "...if a patient does not have 12 qualifying pieces of calculus, we deduct 10 minutes from the student's working time per missing piece of qualifying calculus."

Issues of staffing and time constraints were a frustration for local anesthesia and restorative coordinators. A local anesthesia coordinator commented "...staffing and time constraints prohibit full incorporation." Some restorative coordinators comments were "I truly have not had time to get this mock board together as I wish" and "I would include more of the WREB criteria if there were enough time, space, and personnel." One restorative coordinator, when asked why they do not include all WREB criteria into the MB examination said "Not every area is needed."

The final open-ended question asked if changes had been made to the MB experience in the past three years and if the changes had an impact on WREB performance outcomes. The dental hygiene coordinators reported the most changes. Changes included incorporation of examiner-student anonymity, inclusion of a Chief Examiner, adoption of WREB paperwork, increased number of MB experiences, addition of extra examiners, and implementation of written feedback to students. No comments about these changes having a positive impact on WREB outcomes were made. The restorative coordinators also reported making changes to the MB experiences, such as including examiner-student anonymity and random tooth assignments. One coordinator believed it was not these changes that impacted WREB outcomes "but the radical changes made to the Restorative Lab in the weeks prior to the Mock Board." Local anesthesia coordinators did not report any changes.

### **Relationship Between Characteristics and WREB Candidate Performance**

To explore the relationship between the MB characteristics and WREB candidate performance outcomes, questionnaire data from each program were merged with 2014 WREB candidate result data. The number of eligible schools by MB examination was: dental hygiene  $n = 11$ , local anesthesia  $n = 9$ , and restorative  $n = 6$ . The number of WREB candidates included in the analyses was: DHE  $n = 323$ , LAE  $n = 290$ , and RE  $n = 166$ . Cronbach's alpha internal reliability estimates for the three intensity scores for each examination were moderately high, at 0.80 or above (see Table 4). Values for the examiner calibration score were lower, given far fewer items, and not computed for the local anesthesia examination due to little variation in survey responses. The mean intensity score for the dental hygiene experience was 84.7%, local anesthesia experience was 85.1% and the restorative experience was 91.9%. Likewise, the mean examiner calibration score for the MB experiences were 78.5% for dental hygiene, 90% for local anesthesia and 87.6% for restorative.

Table 5 reports the correlation coefficients between candidate performance outcomes and MB intensity scores and examiner calibration scores. Significant correlations were found with respect to the dental hygiene examination WREB candidate performance outcomes and the intensity score, as well as the examiner calibration score ( $p < 0.01$  and  $p < 0.01$ , respectively). In addition, a significant relationship was found between the restorative examination WREB candidate performance outcomes and the examiner calibration score ( $p < 0.01$ ).

Results of the Chi-Square tests are summarized in Table 6 for the MB characteristics of remediation, student self-assessment, and number of experiences.

These analyses were used to determine whether a relationship existed between candidate performance pass/fail outcomes for the three WREB examinations and each of the three MB experience characteristics. The relationship between the dental hygiene WREB candidate pass/fail outcome and remediation approached significance ( $p = 0.06$ ), whereas the WREB restorative candidate pass/fail outcomes were significantly correlated with MB remediation ( $p = 0.01$ ). A significant relationship also was found between the WREB restorative examination candidate pass/fail outcome and the number of MB experiences ( $p = 0.03$ ).

## DISCUSSION

The findings of this study provide a foundation for understanding educational MB experiences. These findings can assist educators in facilitating experiences that effectively prepare students for clinical board examinations. The degree to which the MB follows WREB examination criteria and procedure may impact candidate performance. For instance, dental hygiene coordinators acknowledged difficulty in finding board qualifying patients and made patient criteria exceptions for the MB examinations. Local anesthesia coordinators also allowed patient criteria leniency. Coordinators for all three examinations indicated some discrepancies in MB procedures. For example, not all the dental hygiene or restorative coordinators reported using the minimum of three evaluating examiners and, for the local anesthesia experience; some coordinators did not enforce an automatic injection failure for a critical error.

Well established criteria uniformly applied during the MB experience has been determined to have a statistically significant relationship on board performance outcomes.<sup>10</sup> The validity and reliability of the MB experience can be questioned when deviations from the board examination criteria and procedures are made. Therefore, MB

coordinators should be thoroughly familiar with and adhere to board examination criteria and procedures.

WREB offers opportunities for faculty to attend Educator Forums as well as observe examinations at any site except their program(s) of employment. Offered in a variety of locations, WREB conducts several Educator Forums throughout the late fall and early winter.<sup>16</sup> The Forums are held primarily to inform schools of changes to the examination and to maintain close relations with the educational community.<sup>16</sup> One educator from each program in a given year is allowed to observe an examination, with this privilege being extended to each observer once every five years.<sup>17</sup> Educators are encouraged to share information about the examination with other educators who teach in their program.<sup>17</sup> These opportunities would also be beneficial for clinical/laboratory faculty in facilitating student learning experiences.

Another recommendation for educators is to become WREB examiners. WREB examiners are trained and calibrated by WREB personnel and practiced in examination criteria and procedures. Before each WREB examination, WREB examiners are required to read the Examiner Manual, Policy Guide, and Candidate Guide, required to participate in online standardization presentations and exercises<sup>18</sup>, and required to participate in Examiner Calibration Workshops. Having faculty as WREB examiners could assist in uniformly applying WREB criteria and procedures to the examination, thereby enhancing the MB experiences for students. WREB examiner experiences also provide professional growth. While many board experiences are confidential in nature, there are numerous opportunities for lifelong learning for faculty through general discussions about experiences with students and colleagues. Also, a student representative from each

program can be nominated and selected to observe an examination. The student is expected to share the experience, which again, will enhance the experiences for student peers.

Coordinators can also encourage students to be familiar with examination criteria and procedures. For WREB examinations, criteria and procedures are updated yearly and are available online in the Candidate Guides. Coordinators can include examination criteria and procedure orientation sessions prior to the MB experience. A formal or informal test or class group activity with active participation about criteria and procedures could provide relevant student learning experiences during class or orientation. The WREB online dental hygiene examination tutorial for students should be reviewed prior to or during the orientation.

In addition to adhering to examination criteria and procedures, MB coordinators might consider including course prerequisites as a requirement for a MB. Course prerequisites are critical to student learning by allowing the student time to learn through deliberate practice with specific feedback.<sup>19,20</sup> Course prerequisites to a MB might include achieving a certain experience base or “grade” in the appropriate clinical course in order to be prepared for the MB. For instance, the student could be required to perform specific experiences providing periodontal debridement for patients with calculus and periodontal conditions similar to those required of a qualifying board patient, or be required to provide a certain number of posterior superior alveolar block injections to the WREB level of proficiency prior to the local anesthesia MB. In addition, MB coordinators might consider incorporating the MB experience as a graded element with significant weight related to the course grade. Grading and including the examination as a

significant weight related to a course's final grade might hold students more accountable to preparation, patient selection, as well as criteria and procedures.

Other recommendations are to incorporate MB experience remediation and student self-assessment. Significant relationships were found between remediation and WREB candidate performance. Remediation is based on the belief that the use of additional support and appropriate resources enhances the potential of students to be successful.<sup>21</sup> For students who fail or falter during MB experiences, remediation would allow faculty to facilitate individualized learning by providing specific feedback.<sup>21</sup> Suggestions for remediation are to pair students who displayed similar problems and have them work together to improve. This strategy could be used with those not successful with a particular injection, charting recession, periodontal probing, debridement procedures, or restoration placement. Students can learn from one another while faculty member time and department resources are maximized with two students, versus one. The faculty member can then provide instant and relative feedback for improvement. Several pairs of students might also provide skills at the same time for a specified amount of time further enhancing faculty resources and student learning. This type of remediation or coaching is likely to be more successful than only discussing the inadequacies.

Student self-assessment is an important learning process that improves performance.<sup>19</sup> It allows students to appraise their performance and reflect on needed improvements and lessons learned.<sup>22</sup> Self-assessment should be evaluated as part of the MB experience and its quality related to MB outcomes and grading. For instance, students might complete a self-evaluation of their performance in relation to the criteria and procedures after the MB and prior to leaving the clinic MB environment or by the



next morning. The thoroughness and accuracy of the self- assessment would become an aspect of the final grade or performance level for the MB. If a student's self-assessment did not correlate with his/her performance, the specifics would need to be discussed to determine why the student was not more accurate in the appraisal. This enlightenment might reveal knowledge, skill, or confidence deficiencies and the means to improve.

A significant relationship was found between multiple MB experiences and WREB candidate performance. Conducting multiple MB experiences is another suggestion for coordinators in preparing students for clinical board examinations. Practicing procedures in a format similar to a board examination should have a positive influence on the examination outcome because the process introduces students to the procedures and testing conditions they will encounter during the examinations.<sup>8,11</sup> Additional experiences might allow students to gain a greater level of self-confidence as well as increased ability to remain focused and calm.<sup>10</sup> Although, increasing the number of experiences strains resources, resources can be allocated by advanced planning and integration into the curriculum. Perhaps a final competency-based exit examination for a clinical course can replicate a MB experience. Possibly two MB experiences could occur; one in the middle of the last year and one towards the end of the last year of education, both evaluated based on student's desired level of competence at that stage of the curriculum.

Examiner calibration is the final recommendation for MB coordinators based on results from this study. Significant relationships were found between examiner calibration and WREB candidate performances. Examiner variation, such as differences in background, knowledge, and opinions as well as unfamiliarity with the accepted

criteria, affect assessment validity and reliability.<sup>23-25</sup> If the MB examination is to be considered reliable in preparing students for board examinations, then the grading mechanism should be consistent. MB examiners need to understand the designated criteria and apply the criteria the same way each time a student's performance is evaluated.<sup>25</sup> Increased examiner reliability can be improved with training.<sup>25, 26</sup> To improve examiner consistency for all three examinations, coordinators can conduct calibration sessions by standardizing to WREB criteria as described in the Candidate Guides. For the dental hygiene examination, calibration could be reinforced by using dentoforms with WREB qualifying simulated calculus or on WREB qualifying patients. These training sessions can include discussion, demonstration, and hands-on practice of specific exploring sequencing for detecting calculus deposits and periodontal pocket depths. Similarly, local anesthesia calibration can be enhanced on WREB qualifying patients and can include discussion and hands-on injection demonstration with emphasis on how to sight critical injection errors. Restorative examiner calibration can be conducted using WREB required instruments on dentoform tooth preparations filled with required restorative materials and also can include discussion, demonstration, and hands-on practice of specific restoration grading criteria. Faculty working in teams can enhance both learning and efficiency. It is likely that discussion alone will not provide calibration to the level necessary to provide students with an optimal experience.

As the open-ended questions indicated, the struggle in finding qualifying patients as well as personnel and time constraints prevented some programs from adhering to WREB criteria and procedures. These issues need to be addressed in order for the MB experience to be a valid, reliable, and an integral component to student evaluation and

readiness for board examinations. However, to address these issues institutional leaders need to explore avenues to allocate sufficient resources to support faculty efforts.

Financial grants could be sought, budget reallocation could occur, and patient recruitment enhanced to overcome some of these barriers. Specific examples to overcome obstacles might be hiring additional personnel as examiners for the MB; screening potential board patients outside of a regularly scheduled clinic session; recommending patient selection meet both MB experiences and WREB experiences; and rearranging curricula to devote adequate time for MB preparation, MB experiences, and remediation. MB coordinators would also need release time or time allocated in their work-load formula, depending on institutional policies. Program strategic planning could address the program's specific barriers and solutions.

It is in the best interest of the program to develop a MB experience philosophy that drives the strategic planning, resource allocation, and criteria and procedures. Often the MB coordinator is responsible for developing the program philosophy; however, this philosophy must be congruent with program goals and mission. Faculty members need to have ownership of this philosophy by participating in its development. Discussion would need to address the students' and educators' roles and responsibilities. Specific discussion might include evaluation of the MB within a course, post MB procedures including remediation, student self-assessment, and examiner calibration. These discussions and decisions would need to occur on a continual basis to maintain relevance of the MB experiences to clinical board examinations.

Most studies investigating MB experiences, including those investigating relationships of MB experiences to the DHNBE, maintained that educational MB

experiences are a valuable tool for introducing students to board examination testing procedures and conditions.<sup>8, 10-13</sup> Therefore, future research could focus on student perspectives such as surveying students after their MB experience and again after their clinical board examination to compare outcomes, stress levels, etc. Such perspectives might include comparing the student's knowledge and understanding of the procedures and atmosphere expected to be encountered to what the student actually encountered during the board examination. Another variable might be the student's ability to cope with stress and anxiety and if the educational MB experiences reduce or alleviate these conditions during the board examination. Additionally, studying the performance outcomes of students who are not successful in completing clinical board examinations on the first attempt might aid educators in designing MB experiences to enhance student success for these high stake examinations.

Study limitations included the sample not being representative of all dental hygiene programs whose students participate in WREB and; thus, caution is recommended regarding generalization to all U.S. programs or all programs located in the western regional board parameters. Also, this study compared MB characteristics to WREB clinical board examination procedures and criteria and; therefore, the results cannot be generalized to other regional or state practical board examinations.

In addition, it is possible these participating programs placed greater emphasis on board examination preparation. Similarly, although the Hawthorne effect and the nature of self-producing data creating bias was reduced by forming items not involving intentions or predictions of measurement, the participants could have been more motivated to take part in the questionnaire. Furthermore, the majority of the participants

held a Masters degree. It is also possible that the respondents were more inclined to participate in research.

Additionally, study limitations included the length of the questionnaires and the nature of online surveys. Internet-based survey questionnaires have issues of compliancy, lower response consistency, and technical issues.<sup>27, 28</sup> Participants may have perceived the questionnaire as too time consuming to complete. Also, due to the ease of administration, internet surveys have increased in popularity. Although efforts were made to promote participation through direct contact and two e-mails to program directors, the program directors may have been inundated with surveys and may not have forwarded the requests to the program's MB coordinators. Questionnaire technical limitations may have included e-mail correspondence being misdirected as incoming unsolicited electronic junk, or spam mail as well as assumptions of appropriate hardware, software, settings, and Internet connectivity for the questionnaire to load, display, and function correctly.<sup>24</sup>

## CONCLUSIONS

Most of the dental hygiene programs surveyed recognized the critical need for student preparation on clinical board examinations; however, differences in program MB characteristics might relate to subsequent board examination performance outcomes. This investigation found common MB characteristic trends that entry-level dental hygiene programs use to prepare their students for WREB clinical board examinations. This study also found statistically significant relationships between some of these characteristics and WREB candidate performance outcomes. These trends and relationships provide fundamental knowledge into MBs that could assist educators in facilitating experiences to more effectively prepare students for board examinations. Although the findings were

limited and the study was specific to the WREB examinations, it is noteworthy that some characteristics such as board examination criteria and procedure adherence, remediation, student self-assessments, multiple MB experiences, and examiner calibration can be applied to other regional or state board examinations. It would be valuable to conduct this study in additional dental hygiene programs that differ geographically to incorporate additional testing agencies board examinations and, therefore, different educational MB experiences.

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Table 1

## Coordinator Demographics (n = 33)

Variable	Parameter	Percentages			
		DHE n = 14	LAE n = 11	RE n = 8	Total n = 33
Employment	Part-time	7.1%	36.4%	25.0%	21.2%
	Full-time	92.9%	63.6%	75.0%	78.8%
Position	Chair or Director	28.6%	18.2%	0.0%	18.2%
	Clinic Coordinator	42.9%	18.2%	25.0%	30.3%
	Faculty Member	14.3%	63.6%	62.5%	42.4%
	Other: Lead Instructor, Adjunct, etc.	14.3%	0.0%	12.5%	9.1%
Highest Degree Earned	Associate	0.0%	9.1%	0.0%	3.0%
	Bachelor	28.6%	45.5%	50.0%	39.4%
	Master	71.4%	36.4%	37.5%	51.5%
	Doctoral	0.0%	9.1%	12.5%	6.1%
Years As An Educator	1-5 years	14.3%	18.2%	50.0%	24.2%
	6-10 years	50.0%	36.4%	12.5%	36.4%
	11-15 years	14.3%	18.2%	12.5%	15.2%
	16-20 years	0.0%	9.1%	0.0%	3.0%
	21-25 years	14.3%	9.1%	25.0%	15.2%
	26-29 years	0.0%	9.1%	0.0%	3.0%
	Over 30 years	7.1%	0.0%	0.0%	3.0%
Years Coordinating	1-5 years	57.1%	36.4%	87.5%	57.6%
	6-10 years	35.7%	36.4%	12.5%	30.3%
	11-15 years	7.1%	27.3%	0.0%	12.1%
2014 WREB Examiner	Yes	7.1%	9.1%	0.0%	6.1%
	No	92.9%	90.9%	100.0%	93.9%
WREB Exams Observed	None	14.3%	27.3%	25.0%	21.2%
	1 exam	42.9%	45.5%	62.5%	48.5%
	2-3 exams	28.6%	9.1%	12.5%	18.2%
	More than 3 exams	14.3%	18.2%	0.0%	21.1%
No. of WREB Educator Forums Attended	None	7.1%	27.3%	25.0%	18.2%
	1 Session	28.6%	27.3%	12.5%	24.2%
	2-3 Sessions	35.7%	18.2%	37.5%	30.3%
	More than 3 Sessions	28.6%	27.3%	25.0%	27.3%

*Note.* Totals may not sum to 100 due to rounding. DHE = Dental Hygiene Mock Board, LAE = Local Anesthesia Mock Board, RE = Restorative Mock Board

Table 2

## Mock Board Characteristics Related to WREB Criteria

WREB Criteria Category	Dental Hygiene			Local Anesthesia			Restorative		
	No. of Items	No. of AR Items	%	No. of Items	No. of AR Items	%	No. of Items	No. of AR Items	%
Preliminary	5	5	100.0%	3	1	33.3%	5	0	0.0%
Equipment/Materials	5	5	100.0%	4	4	100.0%	7	4	57.1%
General Patient	15	7	46.7%	17	6	35.3%			
Oral	9	1	11.1%						
Radiographic	9	2	22.2%						
Dentoform							7	7	100.0%
Preparation							6	6	100.0%
Procedure	15	4	26.7%	22	11	50.0%	27	6	22.2%
Grading Evaluation	14	3	21.4%	28	15	53.7%	15	5	33.3%
Total	72	27	37.5%	74	37	45.7%	67	28	41.8%

*Note.* AR = total number of affirmative responses.

Table 3

Mock Board Characteristics: Course Evaluation, Post Examination Procedures, Student Self-Assessment, Number of Experiences, and Examiner Calibration

Category	Item	Dental Hygiene n = 14		Local Anesthesia n = 11		Restorative n = 8		All MBs N=33	
		AR	%	AR	%	AR	%	AR	%
Course Evaluation	Competency-based MB	6	42.9%	5 <sup>a</sup>	50.0%	1	14.3%	12 <sup>b</sup>	37.5%
	MB as course requirement	14	100.0%	10	90.9%	7	100.0%	31	93.9%
	Completed course prerequisites	4	28.6%	4	36.4%	3	42.9%	11	33.3%
	0 % of final course grade	3	21.4%	5 <sup>a</sup>	50.0%	1	14.3%	9 <sup>b</sup>	28.1%
	1-10% of final course grade	5	35.7%	2	20.0%	2	28.6%	9	27.3%
	11-20% of final course grade	4	28.6%	1	10.0%	3	42.9%	8	24.2%
	21-30% of final course grade	1	7.1%	1	10.0%	1	14.3%	3	9.1%
	31-40% of final course grade	0	0.0%	1	10.0%	0	0.0%	1	3.0%
	41-50% of final course grade	1	7.1%	0	0.0%	0	0.0%	1	3.0%
	Numerical MB grade	11	78.6%	2	18.2%	2 <sup>c</sup>	28.6%	15	46.9%
Post Exam Procedure	Pass/fail MB grade	2	14.3%	7	63.6%	4	57.1%	13	39.4%
	No MB grade	1	7.1%	2	18.2%	1	14.3%	4	12.1%
	Written critique	12	85.7%	9	81.8%	8	100.0%	29	87.9%
	Class review session	10	71.4%	5	45.5%	4	50.0%	19	57.6%
	Individual review session	9 <sup>c</sup>	69.2%	9	81.8%	5	62.5%	23	71.9%
	Review/nonpassing students	2	14.3%	1	9.1%	2	25.0%	5	15.2%
Remediation	MB completion- passing score	7	50.0%	11	100.0%	4	50.0%	22	66.7%
Remediation	Remediation provided	9	64.3%	10	90.9%	5	62.5%	24	72.7%
	Assess experience	6	42.9%	4	36.4%	1	12.5%	11	33.3%
	Assess performance	4	28.6%	4	36.4%	4	50.0%	12	36.4%
	Written assessment	6	42.9%	2	18.2%	2	25.0%	10	30.3%
	Oral assessment	2	14.3%	3	27.3%	3	37.5%	8	24.2%
	Written & oral assessment	1	7.1%	0	0.0%	0	0.0%	1	3.0%
Student Self- Assessment	N/A	5	35.7%	6	54.5%	3	37.5%	14	42.4%
	One MB examination	8	57.1%	3	27.3%	2	25.0%	13	39.4%
	Two MB examinations	4	28.6%	5	45.5%	2	25.0%	11	33.3%
	Three or more MB examinations	2	14.3%	3	27.3%	4	50.0%	9	27.3%
Examiner Calibration	Patient check-in procedure/criteria	12	85.7%			6	75.0%		
	Clinical preparation procedure/criteria			10 <sup>d</sup>	100.0%				
	LA administration procedure/criteria			10 <sup>d</sup>	100.0%				
	Patient check-out procedure/criteria	14	100.0%						
	WREB grading criteria					7	87.5%		
	WREB critical aspects of injection			10 <sup>d</sup>	100.0%				
	WREB less critical aspects of injection			10 <sup>d</sup>	100.0%				
	Conducted on dentoforms	4	28.6%						
	Conducted in clinical setting			10 <sup>d</sup>	40.0%				
	WREB required instruments	14	100.0%	10 <sup>d</sup>	100.0%	7	87.5%	31	96.9%
	WREB required dentoforms/restorations					8	100.0%		
	WREB required restorative materials					7	87.5%		

*Note.* AR = total number of affirmative responses. <sup>a</sup>n = 10 vs. 11, <sup>b</sup>n = 32 vs. 33, <sup>c</sup>n = 7 vs. 8, <sup>d</sup>n = 13 vs. 14, <sup>d</sup>n = 10 vs. 11.

Table 4

## Cronbach's Alpha Reliability Estimates

MB Examination	Intensity Score		Examiner Calibration Score	
	Number of Items	Alpha Reliability Estimate	Number of Items	Alpha Reliability Estimate
Dental Hygiene	72	0.86	4	0.27
Local Anesthesia	74	0.80	6	--
Restorative	67	0.86	5	0.60

Table 5

Correlations Between Intensity Score and Examiner Calibration Score and WREB

Candidate Performance Outcomes

WREB Exam	Intensity Score		Examiner Calibration Score	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Dental Hygiene (Total Points)	0.26	< 0.01	0.18	<0.01
Local Anesthesia (Pass/Fail)	-0.08	0.19	--	--
Restorative (Total Points)	0.05	0.54	0.23	<0.01

Table 6

Chi-square Between Characteristic and WREB Candidate Pass-Fail Performance

Outcomes

Variable	Dental Hygiene		Local Anesthesia		Restorative	
	$\chi^2 (df)$	$p$	$\chi^2 (df)$	$p$	$\chi^2 (df)$	$p$
Remediation	3.66 (1)	0.06	1.99 (1)	0.16	7.65 (1)	0.01
Student Self-Assessment	1.30 (1)	0.26	0.73 (1)	0.39	1.06 (1)	0.30
No. of Experiences	1.12 (1)	0.29	0.81 (1)	0.37	4.71 (1)	0.03