

### **Photocopy and Use Authorization**

In presenting this thesis in partial fulfillment of the requirements for an advanced degree at Idaho State University, I agree that the library shall make it freely available for inspection. I further state that permission for extensive copying of my thesis for scholarly purposes may be granted by the Dean of the Graduate School, Dean of my academic division, or by the University Librarian. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Signature \_\_\_\_\_

Date \_\_\_\_\_

Effectiveness of Online Faculty Calibration

by

Camille M Biorn

A thesis

submitted in partial fulfillment

of the requirements for the degree of

Master of Science in the Department of Dental Hygiene

Idaho State University

Spring 2023

## **Committee Approval**

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of Camille M. Biorn find it satisfactory and recommend that it be accepted.

---

Ellen Rogo, RDH, PhD  
Major Advisor

---

Rachelle Williams RDH-EA, MS  
Committee Member

---

Melody Weaver, PhD, APRN, FNP-BC  
Graduate Faculty Representative

## Human Subjects Committee Approval

August 18, 2022

Camille Biorn  
Dental Hygiene  
MS 8048

RE: Study Number IRB-FY2022-255 : The effectiveness of instructional videos of technique and verbiage in increasing faculty members' intra and inter-rater reliability, feeling of preparedness, and confidence.

Dear Ms. Biorn:

Thank you for your responses to a previous review of the study listed above. These responses are eligible for expedited review under OHRP (DHHS) and FDA guidelines. This is to confirm that I have approved your application.

Notify the HSC of any adverse events. Serious, unexpected adverse events must be reported in writing within 10 business days.

You may conduct your study as described in your application effective immediately. This study is not subject to renewal under current OHRP (DHHS) guidelines.

Please note that any changes to the study as approved must be promptly reported and approved. Some changes may be approved by expedited review; others require full board review. Contact Tom Bailey  
(208-282-2179; email [humsubj@isu.edu](mailto:humsubj@isu.edu))  
if you have any questions or require further information.

Sincerely,

Ralph Baergen, PhD, MPH, CIP  
Human Subjects Chair

---

## **Acknowledgement**

My sincere gratitude and admiration go to my diligent and dedicated thesis committee members and mentors, Dr. Ellen Rogo and Rachelle Williams. I hope they realize how much their time during the summer months and off-contract is appreciated. I value and respect their expertise which has enriched my life both professionally and personally. Their brilliant comments, suggestions, and encouragement have made the thesis process very enjoyable. I thank Melody Weaver for her willingness to service on my committee as Graduate Faculty Representative. Rachelle, I appreciate you spending hours with me creating instructional videos for students and faculty members. Ellen, I appreciate your belief in me that I can do what I set my mind to.

I would also like to acknowledge the Idaho State University dental hygiene faculty members who inspire me and support me in my efforts to conduct this study and develop my thesis.

I dedicate my thesis to the Idaho State University dental hygiene students past, present, and future. You have and you will inspire me to be the best educator that I can be. You are the reason I have pursued the advanced degree of Master of Science in Dental Hygiene. I am blessed that I can truly say that I love my career.

## Table of Contents

List of Figures .....	vii
List of Tables .....	viii
Abstract .....	ix
Chapter 1 Introduction .....	1
Statement of the Problem .....	5
Purpose of the Study.....	8
Professional Significance of the Study .....	8
Research Questions .....	9
Hypotheses .....	10
Conceptual Definitions .....	10
Summary of Chapter 1 .....	13
Chapter 2 Review of the Literature.....	14
Introduction .....	14
Calibration and Student Learning.....	14
Challenges for Delivering and Achieving Calibration .....	19
Methods of Calibration.....	23
Andragogy and Multimedia Instruction .....	26
Calibration Gaps within Dental Hygiene Education .....	30
Summary of Chapter 2 .....	31
Chapter 3 Methodology .....	33
Research Questions/Hypotheses.....	33
Variables.....	34
Research Design .....	34
Research Context.....	36
Research Participants .....	37
Human Subjects Protection .....	38
Data Collection.....	38
Procedure and Protocols .....	40
Reliability and Validity .....	43
Limitations.....	44

Proposed Statistical Analysis .....	44
Summary of Chapter 3 .....	44
References .....	46
Appendix A Questionnaires .....	58
Appendix B Recruitment Email .....	60
Appendix C Human Subjects Committee Informed Consent Form .....	62
Appendix D Competency-Based Education Forms .....	67
Appendix E Agenda Group AB .....	74
Appendix F Agenda Group BA .....	75
Manuscript Title Page .....	76
Manuscript Abstract .....	77
Introduction .....	79
Materials and Methods .....	82
Results .....	86
Discussion .....	88
Conclusion .....	93
Acknowledgements .....	95
References .....	96
Table 1 Kirkpatrick Model Levels Defined .....	100
Table 3 Representative Quotes: Student Feelings Toward Faculty Calibration .....	109
Figure 1 Two-group Randomized cross-over AB/BA design .....	112
Figure 2 Comparison of Reaction Results: Feelings of Confidence and Preparedness .....	113

## **List of Figures**

Figure 1 Two-Period, Two-Sequence Cross Over Design.....	37
--	----

**List of Tables**

Table 1 Kirkpatrick Model Levels Defined.....40

## Effectiveness Online Faculty Calibration

### Thesis Abstract – Idaho State University (2023)

The American Dental Association Commission on Dental Accreditation requires dental hygiene program faculty members show evidence of calibration for clinical teaching. The purpose of this investigation was to determine the effectiveness of online instructional videos on faculty calibration. A sample of convenience of fifteen faculty members from a baccalaureate dental hygiene program were randomly assigned to an AB or BA sequence for calibration on two different instruments. The Kirkpatrick Model levels one through four provided the framework for this investigation. Data were measured via pretests, posttests, retention tests, and Reaction and Impact questionnaires. The online calibration activities yielded significantly higher post-test scores than in-person activities. The online calibration activities increased their feelings of confidence to evaluate student performance. Online and in-person participants were in equal agreement that the calibration activities increased feelings of preparedness to teach. More research is needed to investigate the effectiveness of additional online calibration methods.

Keywords: faculty development, faculty calibration, dental hygienists' education, reliability, multimedia instruction, online instruction

## Chapter 1 Introduction

### Introduction

The American Dental Association (ADA) Commission on Dental Accreditation (CODA, 2022) *Standards for Dental Hygiene Education Programs* require dental hygiene programs to “define and list the overall graduation competencies that describe the levels of knowledge, skills, and values expected of graduates” (p. 20). An example of evidence to demonstrate compliance with this standard includes providing didactic, laboratory, preclinical, and clinical experiences where content learned didactically can be practiced and allow students to progress from the novice to the beginner level and finally to the competent level before graduation. Additionally, the American Dental Education Association’s (ADEA, 2016) *Compendium of Curriculum Guidelines* states that all clinical skills habitually performed by a registered dental hygienist must be taught to the level of competency in dental hygiene programs. One method of determining clinical competence during patient care is the observation by clinical faculty (Tucker et al., 2018). However, according to a literature review, the lack of validity and reliability between instructors while assessing clinical competence has been well established (La Chimea et al., 2020). Administrators responsible for the clinical curriculum must provide training opportunities to calibrate clinical instructors to assess the competence of dental hygiene students in a valid and reliable manner (ADA, 2022; La Chimea et al., 2020).

Clinical instructor calibration is defined by Tabussum (2022) as the degree to which various faculty members consistently agree with one another during student evaluation (inter-rater reliability) or the reliability of one faculty member’s assessment of student performance on different occasions (intra-rater reliability). For evaluators to be considered reliable, they must understand assessment criteria, apply these criteria consistently and in the same way in each

instance of evaluating a student's performance, and must be able to make the same qualitative assessments as other evaluators based on criteria (Garland & Newell, 2009). Calibration is not a new topic among dental and dental hygiene educators. However, limited literature has been published specific to dental hygiene, while literature relative to calibration in dental and medical education is vast (Dicke et al., 2015; Garland & Newell, 2009). In addition, more research is devoted to teaching in didactic versus clinical settings (Dicke et al., 2015).

Didactic instruction is usually provided by one faculty member, though students apply the knowledge learned in the classroom to the clinical setting during patient care under the guidance of multiple clinical instructors (Tabassum et al., 2022). The requirement to provide multiple instructors is mandated by the CODA standards and states that there must be a ratio of one faculty member for every six dental hygiene students in the clinical setting (ADA, 2022). Calibration exercises are needed to increase inter-rater reliability between the numerous instructors, especially in areas where there are opportunities for subjectivity (Brame et al., 2017). For instance, numerous clinical instructors show discrepancies in clinical procedures and techniques such as periodontal probing and diagnosis (Seabra et al., 2008), care planning (Lanning et al. 2005), calculus detection (Garland & Newell, 2009; Partido et al., 2015; Santiago et al., 2016), assessment of cavity preparations (Sharaf et al., 2007), interpretation of radiographs (Lanning et al., 2006), and evaluation of student performance (Park et al., 2009). The study by Park et al. (2009) indicated that novice faculty members showed more variation than seasoned educators. This variability is related to the little or no training offered to new adjunct clinical faculty members (Smethers et al., 2018); however, they are expected to assume entry-level teaching positions with proficiency in teaching and evaluation. A difference in teaching skills between new and more experienced faculty members was noted by 59% of surveyed students,

indicated by “positive experiences” with experienced members and “negative” experiences with new members (Paulis, 2011). These shortcomings highlight the need for formal training in educational methodologies and evaluation instruction of skills for new clinical adjunct faculty members.

Clinical instructors with unique expertise, background, and clinical skills work toward the common goal of creating competent clinicians. However, variability in evaluation methods, teaching strategies, and clinical skills detract from student learning, attention to patient care, and the motivation for a student to perform to the highest standard (Brame et al., 2017; Dicke et al., 2015; Garland & Newell, 2009). Students may not execute a skill to their best ability if they believe the evaluation is subjective and inconsistent (Garland & Newell, 2009). Conflicting information, verbiage, and messages from evaluators can cause frustration, confusion, and dissatisfaction among students (Jacks et al., 2008; Kang et al., 2015). Multiple methods exist to effectively perform skills, but for a novice learner acquiring problem solve and critical thinking skills, these inconsistencies are difficult to process (Dicke et al., 2015). Moreover, the level of student performance is correlated to the effectiveness of the clinical instructor (Roberts et al., 2013).

To address differences and variations in evaluation, it is necessary to understand students’ and faculty members’ perceptions of the barriers they observe having an impact on learning. In a study conducted by Ebbeling et al. (2015) of 600 undergraduate students of Oral Health and Dental Surgery participants reported that “different tutors had different grading criteria,” and these inconsistencies caused increased stress in the clinical learning environment (p. 1039). Additionally, dental hygiene students reported they thought their instructors required greater calibration and they had difficulty learning because there was an irregularity in the

curriculum (Belinski & Kanji, 2018). Students reported changing their performance based on which instructor was evaluating them or to earn a higher grade (Brame et al., 2017; Deeb et al., 2019; Dicke et al., 2015). Additionally, students reported the differences among faculty members in evaluation were a major concern, and 20% of the educational program's weaknesses were related to discrepancies in faculty evaluation (Henzi et al., 2007). Moreover, 59% of faculty participants indicated they would have more positive and effective interactions with students if they received more professional preparation (Paulis, 2011). Novice nursing faculty have reported dissatisfaction in their experiences transitioning from clinical nursing to education (Forbes et al., 2010). Dissatisfaction stemmed from a feeling of unpreparedness and lack of confidence due to insufficient educational resources offered by the institution and discomfort teaching unfamiliar material and skills (McDermid et al., 2013). These inadequacies highlight the need for training resources for the novice as well as seasoned faculty members. Educators are willing to participate in calibration exercises. Researchers report that 97% of dental educators felt that faculty calibration was essential, and 88% were willing to attend calibration exercises even if not mandated (Tabassum et al., 2022).

There are mixed results in the literature about the effectiveness of faculty calibration exercises, some ranging from slightly effective to not at all effective (Garland & Newell, 2009). Although no data exist documenting the relationship between faculty calibration and learning outcomes of dental hygiene instrumentation, variability between instructors can distract from student learning, cause confusion and frustration, and affect the definitive goal of achieving competence (Garland & Newell, 2009; Henzi et al., 2005). Researchers, though conflicted about the effectiveness of calibration, did agree that frequent calibration is essential (Steinert et al., 2016). Steinert, et al. (2016) concluded that faculty development exercises such as experience,

observation, mentoring, short courses, seminar series, feedback, and online courses (all components of faculty calibration) had a positive impact on teachers' knowledge, attitudes, and skill. When researchers surveyed faculty members regarding the characteristics of, quality of, and satisfaction with calibration efforts, 69% reported that educators were required to participate, but nearly one-fourth of participants reported that attendance was not required of clinical faculty (Dicke et al., 2015). Others reported that even when calibration exercises were mandatory, these events were not attended, and some required only specific faculty members to attend. Some written responses indicated that finding a time to get all faculty together to participate was challenging. Faculty members' preferences regarding the delivery of calibration exercises (face-to-face versus virtual) can affect attendance and reception (Brame et al., 2017; Carter, 2017; Dicke et al., 2015; Proctor et al., 2020).

Additional research specific to dental hygiene is needed, such as identifying supplementary calibration methods that target clinical faculty inconsistencies (Dicke et al., 2015). Faculty calibration has been proposed as one way to improve student satisfaction (Garland & Newell, 2009), and educators are willing to participate (Dicke et al., 2015). It is impossible to expect unique individuals to be 100% identical in evaluation, but frequent skill calibration exercises can help minimize inconsistencies between evaluators and increase faculty members' credibility, student satisfaction, and intra and inter-rater reliability (Dicke et al., 2015).

### **Statement of the Problem**

The ADA CODA (2022) *Standards for Dental Hygiene Education Programs* require dental hygiene program faculty members show evidence of calibration for clinical teaching. Dicke et al. (2015) reported that most calibration occurring in the clinical setting was discussion rather than actual skill standardization, which is imperative to show evidence of calibration for

clinical teaching. One suggested method to close the gap between discussion and clinical skill development is the use of multimedia instruction (MMI) (Issa et al., 2013). Multimedia instruction is defined as the use of visual aids as well as words to foster learning (Mayer, 2009, as cited in Mayer, 2017). Visual aids can be in the form of photos, diagrams, maps, illustrations, videos, and animation. DiGiacinto (2006) reported that adult learners performed better when verbal information is supplemented with visual information. Study outcomes by Donovan (2018) recommended MMI training for new and existing dental hygiene faculty be increased. Discussion is important but can be enhanced with skill standardization instruction using MMI. Electronic learning has recently become a noteworthy trend in education. Digital learning materials such as instructional videos provide common resources to deliver training simply and economically, and can be viewed at any time and repeated as needed (Korkut et al., 2015).

A review of the literature shows few or no attempts at improving clinical faculty intra and inter-rater reliability using pre-recorded video; however, multiple studies have been conducted testing nursing student performance outcomes with supplemental video instruction (Hibbert et al., 2013; Holland et al., 2013; Steedman et al., 2012). From the students' perspective, they strongly agreed that the use of videos compared to traditional teaching methods helped them learn the skill more readily (Hibbert et al., 2013). For example, nurses given unlimited access to an online training video in addition to traditional lectures and skills courses performed significantly better on skills exams (Holland et al., 2013). They also were more pleased with the learning experience than those who received traditional teaching only. In addition, educational video resources may be more effective at delivering content in a more time-efficient manner (Steedman et al., 2012). From the faculty perspective, providing electronic video resources ensures all clinical faculty have access to the same training information and allows them to have

access to study and review exercises at a time more convenient than scheduled calibration exercises (Rogers et al., 2008).

Little is known about the effects instructional video could have on clinical faculty intra and inter-rater reliability, confidence, and feeling of preparedness in dental hygiene education. An instructional technique video was used for faculty calibration in a 2017 pilot study to explore the effectiveness of head and neck exam standardization (Carter, 2017). Based on the results, the use of an instructional video increased the knowledge level of DH clinical faculty for head and neck examinations. In another pilot study, the experiences of novice dental hygiene faculty when transitioning from private practice into clinical teaching roles were studied. Even though orientation sessions and calibration meetings were offered, 36% of novice faculty participants reported that visual aids, such as instructional videos and hands-on demonstrations would have helped them prepare for new teaching roles (Smethers et al., 2018).

Electronic video instructional training has also shown to be beneficial amid the unexpected COVID-19 pandemic. Technological interventions such as virtual meetings with colleagues were introduced (Shah, 2020). The use of technology for instruction is gaining momentum now, and its practicality and cost-effective nature have demonstrated importance during the COVID era and may prove important in the post-COVID era. Since educators have been inescapably pushed to rely on technology-based instruction, it can be embraced, developed, and evaluated for application in education post-COVID (Sahi et al., 2020). For example, the University of Florida College of Dentistry met the challenge of social distancing requirements by using electronic media for calibration activities (Oliveira et al., 2021). Electronic media allowed calibration exercises to continue with no face-to-face interaction. Faculty members reported that this method of calibration was convenient and allowed flexibility with a variety of schedules.

Additionally, faculty members acknowledged the effectiveness of the electronic calibration method since they could pay particular attention to the activity without any distraction. This convenient, economical, and effective means of electronic calibration should be evaluated for long-term sustainability.

### **Purpose of the Study**

The purpose of this study was to determine the effectiveness of instructional videos on faculty calibration, feelings of preparedness, and confidence.

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

Both dental hygiene clinicians and researchers can recognize the importance of making decisions based on knowledge obtained from research and clinical experiences. The *National Dental Hygiene Research Agenda* (NDHRA) identifies the following as priorities that will help advance the dental hygiene profession:

1. Differences between baccalaureate- and associate-level educated dental hygienists.
2. The impact of dental hygiene mid-level practitioners on oral health outcomes.
3. Development and testing of conceptual models distinct to dental hygiene that will guide education, practice, and research.
4. Efficacy of preventive interventions across the lifespan including oral health behaviors.
5. Patient outcomes in varying delivery systems (this can include cost-effectiveness, workforce models, telehealth, access to care, direct access, etc.). (Lyle et al., 2016, p. 49)

This research aligns with the NDHRA which prioritizes professional education and development by testing conceptual models that will guide education, clinical practice, and future

research (ADHA, 2016). Additionally, this study relates to the ADHA *Standards for Clinical Practice* Revised 2016, which state professionals are responsible to “participate in activities to enhance and maintain continued competence and address professional issues as determined by appropriate self-assessment” and to “commit to lifelong learning to maintain competence in an evolving health care system” (ADHA, 2016, p. 5). Administrators in dental hygiene education, such as clinic coordinators, must be responsible for providing verbal and visual calibration exercises to novice and seasoned faculty members to maintain their continued competence in evaluation. Clinical instructors must be responsible for participating in activities to maintain calibration competence. This research also supports the 2022 CODA *Accreditation Standards for Dental Hygiene Education Programs* which requires dental hygiene program faculty members to show evidence of calibration for clinical teaching and have “current knowledge of the specific subjects they are teaching” and “documented background in current educational methodology concepts consistent with teaching assignment” (CODA, 2022, p. 32). Recommendations outlined by ADEA guidelines (2015-2016) suggest that dental hygiene faculty have sufficient experience and knowledge in educational methodologies, testing, and evaluation, and this study will support these recommendations.

### **Research Questions**

1. Is there a significant difference in post-test instrumentation evaluation scores between the group participating in in-person calibration and the group participating in online calibration?
2. How does the reaction (feelings of confidence as preparedness) of the online calibrated participants compare with the reaction of the in-person calibrated participants?

3. How does the impact (behavioral changes as a result of the calibration) of the online calibrated participants compare with the impact of the in-person calibrated participants?
4. Is there a significant difference in instrument evaluation scores between the pretests before any calibration to retention tests at the end of the semester?
5. Is there a significant difference in online calibrated versus in-person calibrated retention instrument evaluation scores?

### **Hypotheses**

The null hypotheses related to this study were:

H0: There will be no statistically significant difference between posttest scores of the evaluation of the 11/12 Explorer (online) and the evaluation of the Gracey 1/2 Curette (in-person).

H0: There will be no statistically significant difference in instrument evaluation scores between the pretests to retention tests.

H0: There will be no statistically significant difference in online calibrated versus in-person calibrated retention instrument evaluation scores.

### **Conceptual Definitions**

**Feeling of preparedness:** Feeling of being ready for and competent in evaluating students in the clinical setting.

**Feeling of confidence:** Feeling of being able to trust in one's own abilities to evaluate students in the clinical setting.

**Electronic learning.** Electronic learning is the conveyance of instructional material using digital resources.

**Faculty calibration.** Faculty calibration is the standardized instruction established to evaluate student performance with little or no inconsistency using dependable theories, consistent evaluation methods, and defined criteria (Garland & Newell, 2009).

**Inter-rater reliability.** This term refers to the degree that which two or more individuals agree. In dental hygiene education, inter-rater reliability refers to the extent that which two or more different evaluators would agree.

**Intra-rater reliability.** Intra-rater reliability in dental hygiene education refers to the extent to which an instructor would evaluate the same assessment, in the same manner, more than once.

**Instructional videos:** Videos used to train clinical faculty to use similar verbiage, instruction, and evaluation criteria, when evaluating students in the clinical setting.

**Multimedia instruction.** Multimedia Instruction (MMI) refers to a learning environment that uses visual aids as well as words to foster learning (Mayer, 2009, as cited in Mayer, 2017)

**Novice clinical faculty.** This term refers to a clinical faculty member who is new to or inexperienced in clinical instruction.

**Seasoned clinical faculty.** This term refers to a clinical faculty member who has a lot of experience in clinical instruction.

**Standardization.** Merriam-Webster (2022) defines standardization as, “bringing into conformity with a standard, especially to assure consistency and regularity.” In dental hygiene education standardization would ensure that students would be given the same set of instructional conditions including how teachers presented information.

## Operational Definitions

**Intra-rater Reliability:** The extent to which one evaluator is consistent in evaluation over time will be measured comparing a pretest (evaluation of instrument technique) with a posttest (evaluation of instrument technique) using a gold standard or key developed by the PI and a co-investigator.

**Inter-rater Reliability:** The extent to which different evaluators agree with one another will be measured comparing a pretest (evaluation of instrument technique) with a posttest (evaluation of instrument technique) using a gold standard or key developed by the PI and a co-investigator.

**11/12 Explorer Rubric:** The pretest, posttest, and retention test for the 11/12 Explorer will have 30 points possible. If a mistake is identified incorrectly, not identified, or a mistake identified that does not exist, that will constitute an error on the test. The maximum possible points earned will be 30/30. The participant will earn a percentage score on the pretest and posttest.

**Gracey 1/2 Rubric:** The pretest, posttest, and retention test for the Gracey 1/2 will have 30 points possible. If a mistake is identified incorrectly, not identified, or a mistake identified that does not exist, that will constitute an error on the test. The maximum possible points earned will be 30/30. The participant will earn a percentage score on the pretest and posttest.

**Feeling of Preparedness:** Feeling of preparedness regarding instruction and evaluation will be assessed using a 5-question Likert scale ranging from 1-7. Participants will rank responses on a Likert scale range of: 1=Completely Disagree; 2=Mostly Disagree; 3=Somewhat Disagree; 4=Neither Agree or Disagree; 5=Somewhat Agree; 6=Mostly Agree; 7=Completely Agree. The range of scores for each question will be 5-35.

**Feeling of Confidence:** Feeling of confidence regarding instruction and evaluation will be assessed using a 5-question Likert scale ranging from 1-7. Participants will rank responses on a Likert scale range of: 1=Completely Disagree; 2=Mostly Disagree; 3=Somewhat Disagree; 4=Neither Agree or Disagree; 5=Somewhat Agree; 6=Mostly Agree; 7=Completely Agree. The range of scores for each question will be 5-35.

## **Summary of Chapter 1**

Dental Hygiene faculty members often do not provide consistent instruction in the clinical setting. Previous research has detailed inconsistencies in evaluation due to education, clinical experience, and variation in judgment. Students may not perform to their best ability if they feel that evaluation is subjective and varies among different faculty members. Students become frustrated and dissatisfied when instruction is conflicting and faculty members are not calibrated. Currently, there is limited literature published specific to dental hygiene, and little is known about the effects instructional video could have on clinical faculty intra and inter-rater reliability, confidence, and feeling of preparedness in dental hygiene education. Therefore, more research is needed specific to faculty calibration in dental hygiene and with instructional videos for calibration in dental hygiene education. Organizations such as CODA and ADEA have clearly outlined calibration requirements and objectives for faculty members. To meet these objectives, dental hygiene programs should offer frequent calibration exercises that are cost-efficient and convenient, like instructional video use. The next chapter will present relevant literature related to the topic of calibration and student learning, challenges encountered in calibration efforts, methods of calibration, gaps, and the use of multimedia instruction for calibration.

## Chapter 2 Review of the Literature

### Introduction

To evaluate competencies and ensure students are prepared to perform all necessary tasks required by entry-level dental hygiene clinicians, dental hygiene programs must implement strategies for evaluation. One of the most widespread methods to assess clinical performance and competency is through clinical faculty evaluation (Tucker et al., 2018). Accurate, consistent, and reliable evaluation is imperative to competency-based education. However, most dental hygiene faculty do not provide consistent evaluation or instruction especially when the evaluation is subjective (Partido et al., 2015). Inconsistencies can lead to negative learning outcomes, dissatisfaction, worry, and anxiety, ultimately affecting patient care. Very little research exists examining dental hygiene educator calibration or the use of multimedia instruction for the calibration of dental hygiene faculty. This literature review centers on the following specific sections: calibration and student learning, challenges for delivering and achieving calibration, methods of calibration, andragogy and multimedia instruction, and calibration gaps within dental hygiene education. Data bases search included CINAHL Complete; Dissertations and Theses, ProQuest; EBSCO Host, and PubMed. Dates searched were limited to 2012 to 2022 and key MeSH terms included “faculty development”, “calibration”, “andragogy”, “multimedia instruction”, “clinical competency”, “dental hygiene”, “nursing”, and “education”.

### Calibration and Student Learning

The American Dental Education Association’s (ADEA, 2015-2016) *Compendium of Curriculum Guidelines* stated that every clinical skill routinely performed by a registered hygienist needs to be taught to competency in dental hygiene programs. Furthermore, the Commission on Dental Accreditation (CODA) *Standards for Dental Hygiene Education*

*Programs* states that the dental hygiene program must “define and list the overall graduation competencies that describe the levels of knowledge, skills, and values expected of graduates” (ADA, 2022, p. 20). Competency-based education (CBE) ensures students are prepared to perform all tasks required by entry-level clinicians in a satisfactory and acceptable manner (Tucker et al., 2018). To evaluate these competencies, dental hygiene programs must employ strategies to determine students’ performance levels. One of the most widely used methods to assess clinical competence is through observation by clinical faculty members. The ability to assess student performance accurately and reliably over a period of time is imperative to CBE (Gunnell et al., 2016). Clinical dental hygiene faculty are expected to rate or evaluate students equally. That is, students should receive similar scores regardless of the evaluator. Furthermore, the accreditation standards for dental hygiene programs require that clinical educators have documented backgrounds in educational theory and methodology before beginning clinical education and evidence of faculty calibration for clinical evaluation (ADA, 2022). Calibration efforts are challenged especially if there are multiple faculty members to accommodate a large student population. Likewise, the ability to determine if a student has met the complex range of skills and knowledge necessary to enter competently into clinical practice is challenged by issues of reliability and validity (La Chimea et al., 2020).

Dental hygiene faculty members do not always provide consistent instruction, especially in the instances where evaluation is subjective or requires clinical judgment (Partido, 2017). Inconsistent evaluation can lead to negative student learning outcomes such as decreased critical thinking, problem-solving, understanding, and application of knowledge (Jacks et al., 2008). That is, inconsistent assigning of grades can lead to a decline in morale and a decrease in motivation to improve skills. A study of three dental schools discovered “a significant source of

trouble, worry, and discomfort; a major source of anger; and one of the primary reasons for the abandonment of a quest for excellence and resignation to just getting by” (Jacks et al., 2008, p. 719). However, the full effect of inconsistent instruction and evaluation on student learning outcomes is still unknown (Garland & Newell, 2009; Partido, 2017; Santiago et al., 2016). Although the investigation of the effect of inconsistent instruction is still ongoing, clinical instructor respondents of one study perceived students to be more satisfied with clinical experiences when their instructors were calibrated and more frustrated when instructors were not calibrated (Dicke et al., 2015). Garland and Newell (2009) observed that accuracy and uniformity in evaluation enhance student learning, motivation, and satisfaction, and ultimately positively affect patient care.

Negative learning outcomes also stem from changing performance based on which instructor is evaluating in a particular instance. Students have reported altering their performance based on instructors’ preferences and scheduling with particular instructors for testing to earn better grades (Brame et al., 2017; Deeb et al., 2019; Dicke et al., 2015). When students are focused on pleasing a particular instructor to earn higher marks, versus focused on patient care, potentially harmful effects can result and negatively affect student learning outcomes (Brame et al., 2017). For example, the results of a 2019 pilot study showed that students sought out faculty members who were perceived to grade higher and scheduled testing during the time with these instructors (Deeb et al., 2019). The focus should be directed on clinical standards, and students lose this focus when they assume faculty-specific tactics for addressing clinical challenges (Jacks et al., 2008).

Learners rely on feedback on their clinical performance to improve and achieve a higher level of performance in the future and attain clinical competence (Haj-Ali & Feil, 2006). If

consistent and reliable feedback is lacking, students will be unsure of the standard expected and may not be able to progress as expected toward clinical competence. Students may also lack the motivation to correctly self-evaluate (a skill necessary for life-long learning) their performance when feedback from faculty members is erratic (Haj-Ali & Feil, 2006).

Additionally, students reported that they had difficulty gaining clinical competence because of the anxiety and stress that variability of instruction within the curriculum causes (Belinski & Kanji, 2018). A review of the literature by Chimea (2020) examined barriers to achieving clinical competence and determined a lack of unanimity and the variability in the evaluation to be a common variable. Although students craved feedback from individual educators, they perceived inconsistency within clinical evaluations, and this variation in the evaluation was a great source of stress during their clinical education (Belinski & Kanji, 2018; Ebbeling et al., 2018). Stressors negatively affect learner performance and health (Rezaei et al., 2020). Several studies showed that approximately 20%-45% of college students experienced at least one mental health disorder in a given year (Amanvermez et al., 2020), and a lack of consistency between clinical faculty members adds to this stress and is detrimental to student health. That is, the learning environment and instructors are listed as two of the most distinctive stressors in the field of education and a detriment to obtaining clinical competence (Rezaei et al., 2020).

Clinical teaching environments are very important in preparing dental hygiene students for their professional roles and supporting positive learning outcomes. The clinical environment includes all the conditions and stimuli that affect learning (Yazdankhahfard et al., 2020), and the learning environment is a significant determinant of student behavior and contributes to students' academic success, satisfaction, and professional goals (Kang et al., 2015). Undergraduate dental

hygiene students spend a significant amount of time in the clinical setting; however, time does not guarantee adequate education because there are so many variables that contribute to effective learning. Examples of variables that affect learning outcomes include stress, students' willingness to learn, uncalibrated clinical instructors, attitudes of both learners and instructors, and environment; and prepared, competent clinical instructors are central to creating an exceptional learning environment (Belinski & Kanji, 2018). Paulis (2011) surveyed 258 dental hygiene students and found that the students perceived their clinical instructors to be underprepared to be clinical educators, thus negatively affecting the learning environment.

Studies report that some clinical dental hygiene educators enter academia with less training in educational methodologies than educators in other disciplines (McGuinness, 2016; Paulis, 2011). Clinicians are often hired into adjunct faculty positions based on their clinical experience and not on their knowledge of adult education and learning (Roberts et al., 2013). Clinical instructors who are very competent clinicians still fall short when it comes to having all of the relevant knowledge and educational methodologies to be an educator (Hunt et al., 2013; Kimbrough-Walls, 2012). Novice clinical educators feel particularly underprepared as they enter academia (Dicke et al., 2015; Gordon, 2013; McGuinness, 2016; Paulis, 2011; Russell, 2016). Few have pedagogical experience, are offered a new hire orientation or faculty development, or receive sufficient training, yet are expected to teach complex materials and concepts to students (Davis-Porter, 2021). Novice clinical nursing faculty participants in one study declared the orientation and formal preparation they received to be helpful but reported the materials to be very generalized, not meeting their need to help the transition into a teaching role (Roberts et al., 2013). Likewise, participants noted a feeling of being overwhelmed and being left alone because they did not have a formal mentor or sufficient resources. Clinical administrators need to make

the transition from clinical practice to academia easier for adjunct faculty who may not have an educational background.

### **Challenges for Delivering and Achieving Calibration**

Faculty calibration is a challenge to achieve, likely because faculty members graduated from different programs at different times, have had different clinical experiences, and are set in their ways of implementing dental hygiene care (Brame et al., 2017; McAndrew, 2016). Previous experiences predispose individuals to diverse preferences and tendencies which have challenged calibration efforts (Partido et al., 2015; Xu et al., 2020). Other challenges include having a lack of time for calibration and recalibration efforts, a high turnover of faculty, an increasing number of part-time faculty members, a lack of instructional material offered to new educators, and discrepancy between full and part-time faculty members (McAndrew, 2016). Preference for how the calibration is received (in-person or virtually) can also affect faculty reception and the success of calibration efforts (Brame et al., 2017; Carter, 2017). Moreover, during the COVID-19 pandemic, faculty members were not able to meet in person to calibrate, and alternative methods of achieving calibration were pursued (Oliveira et al., 2021). Lastly, faculty reception of calibration energies may be challenged by lack of compensation (Dicke et al., 2015).

Calibration efforts are tedious and time-consuming for faculty members and administration (Gunnell et al., 2016), but calibration is attainable with hard work, persistence, and maintenance (Garland & Newell, 2009). Also, there is a discrepancy in the literature about how much time should pass before recalibration and it has not been definitively established (McAndrew, 2016). Studies have reported that to maintain intra and inter-rater reliability, follow-up calibration exercises should be offered anywhere from 10 weeks to 1 year after the initial training. Haj-Ali et al. (2006) evaluated the immediate effects of inter-rater agreement to a

gold standard to determine if reliability could be sustained over a 10-week period. It was concluded that with calibration, inter-rater agreement with a gold standard improved and could be reasonably maintained for a 10-week time period. Brame et al. (2017) tested the use of a self-instructional radiographic anatomy module to determine if it improved dental hygiene faculty calibration regarding the identification of normal radiographic anatomy and if its effect could be sustained over a period of four months. The follow-up post-test was given four months after the faculty reviewed the online module. Because there was an extended lapse between observing the online module and taking the follow-up post-test, there was a decrease in retention. Researchers concluded that a one-time follow-up for calibration may not be adequate (Brame et al., 2017).

In addition to time considerations, shortages of dental hygiene educators and a rise in the number of part-time adjunct faculty members also add to the challenge of delivering and achieving calibration (Brame et al., 2017; Carr et al., 2010; Davis-Porter, 2021). In an attempt to overcome this faculty shortage, recruitment of part-time faculty has become a tendency (Brame et al., 2017). A 2010 review of the literature revealed almost half of the full-time faculty members were reaching retirement age and would be expected to retire within the next ten years (Carr et al., 2010). A decade later, shortages due to mass retirement are a reality, but there are additional contributing factors to the faculty shortages. Shortages may also be attributed to inadequate compensation offered to clinical faculty compared with that of clinical practice (Belinski & Kanji, 2018), fewer graduates possessing the required baccalaureate or master's degree needed to transition into a teaching role, and unmet training needs for new faculty (Russell, 2016; Smethers et al., 2018). Some instructors leave academia because of unexpected challenges in education such as unanticipated demands of teaching and incivility from other faculty members (Smethers et al., 2018). This high turnover leaves the remaining faculty

members with additional teaching responsibilities and less time for faculty development.

Overloaded faculty members and a high turnover of new faculty members (many of which are part-time) add to the strain of the calibration need with less time available and more need for mentorship. One study reported that it was difficult to get part-time faculty members to attend calibration meetings because they had commitments to other employers (Dicke et al., 2015).

Moreover, there is a discrepancy between clinical instruction that newly appointed educators expect to receive and the instruction they actually receive (Belinski & Kanji, 2018). One study that focused on the needs of new faculty members reported a lack of supportive information and instruction to transition from clinical practice into education (Donovan, 2017). These participants also described learning from observation versus formal instruction, resulting in feelings of anxiety and embarrassment in front of students. Moreover, lack of preparation in managing curriculum, instructing, supervising and testing, and technology was a consistent challenge (Donovan, 2017). Additionally, clinical instructors often do not have a background in adult learning theory and practice, and they teach adult learners with very different learning styles (Hunt et al., 2013). Dental hygiene clinical instructors may be proficient in the clinical setting but lack the background needed to teach adults effectively (Hunt et al., 2013; McGuinness, 2016). Dental hygienists entering clinical education could benefit from formal instruction in andragogic methodologies, communication techniques, and assessment and evaluation theories (Belinski & Kanji, 2018; Fritz, 2018). Requirements set forth by the ADA CODA (2022) clearly state a documented background in current educational methodology concepts supporting teaching assignments is mandatory.

Another challenge in achieving faculty calibration is the differences in evaluation patterns presented by full-time faculty versus part-time faculty. Adjunct dental hygiene faculty

members are those who typically are hired to teach the clinical component of courses but usually do not teach in the classroom. They show excellent expertise in the clinical setting, bringing real-life experience (Deeb et al., 2019), however, adjunct faculty members are not always familiar with the learning objectives needed to thoroughly evaluate clinical performance (Deeb et al., 2019; Hunt et al., 2013). Full and part-time adjunct faculty members should be equally prepared to evaluate students objectively, and evaluation should be reflective of the students' knowledge and performance. However, even after calibration exercises, Deeb et al. (2019) found that adjunct faculty members still awarded higher grades than full-time faculty members, and full-time members tended to be better calibrated and more consistent with evaluation. Even though students acknowledged that full-time faculty members possessed more inter-rater reliability and provided more valuable feedback than part-time adjunct faculty, students sought out adjunct faculty members who seemed to grade more favorably. Prioritizing scores over valuable feedback is detrimental to learning and shows a need for calibration between adjunct and full-time faculty members. In contrast, Carter et al. (2017) observed participants with more years of clinical teaching experience had lower pre-calibration test scores. The lower scores could be due to failure to rejuvenate themselves periodically with fresh verbiage and technique in clinical instruction.

Calibration efforts are also challenged by the preference for receiving calibration and by the COVID-19 pandemic. The preference for calibration may be to receive it remotely, especially if faculty members are required to travel or if other responsibilities compete for time (Dicke et al., 2015). Additionally, the COVID-19 pandemic presented challenges for calibration on-site and in-person with social distancing guidelines. The University of Florida College of Dentistry (UFCD) met the challenge of social distancing by offering calibration sessions via

electronic media (Oliveira et al., 2021). The goal of piloting this faculty calibration electronically was to identify discrepancies in evaluation between faculty members followed by a recalibration plan. Faculty members who had variations in evaluation from the majority were prompted at the end of the training to receive further calibration. The electronic training was also used to reinforce calibration as needed. Participants in the study at UFCD acknowledged the convenience of the online training. Soto et al. (2020) tackled the challenge of certifying competencies across dental disciplines and calibrating faculty during the pandemic by replacing face-to-face interactions with virtual activities. Improvements in calibration through post-presentation discussions were observed. Furthermore, these virtual discussions allowed for opportunities that would not have been possible face-to-face such as holding more activities per day to allow for more students and flexibility of scheduling.

Lastly, faculty reception of calibration energies may be challenged by a lack of compensation for attendance (Dicke et al., 2015). Written responses from dental hygiene faculty participants revealed that some institutions paid part-time but not full-time educators as it was considered part of their contracted duties to attend faculty development activities. Some institutions compensated one calibration session per semester, while others offered continuing education credit versus cash compensation. For distance education sites, travel may be required for some faculty members to attend. Though compensation may increase attendance to calibration exercised, budget restraints may prevent this (Dicke et al., 2015).

### **Methods of Calibration**

A variety of training programs have been implemented or investigated for improving reliability and consensus among dental hygiene faculty. Typically, calibration exercises consist of teaching the use of rubrics or checklists and leading hands-on activities (McAndrew, 2016).

However, didactic and clinical exercises with typodonts have been used to improve inter-rater reliability in calculus detection (Garland & Newell, 2009; Partido et al., 2015) and amalgam preparations (Haj-Ali & Feil, 2006). Another researcher used clinical patients to improve inter-rater reliability among faculty in calculus detection (Santiago et al., 2016). In a study by Drucker et al. (2012), clinical patients were used to helping improve consensus in periodontal examination between faculty and students. Additionally, clinical simulations have been used for increasing agreement between evaluators in the diagnosis and care planning of periodontal diseases (John et al., 2013; Lane et al., 2015). Moreover, photographic images of postures were used to supplement a modified dental operator ergonomics assessment tool to improve interrater reliability among dental hygiene faculty members (Partido, 2017). Lastly, didactic lecture, a live demonstration, and practice with digital feedback were utilized to evaluate the effect of standardized training on faculty crown preparation performance (Xu et al., 2020).

In a 2016 systematic review of the literature, researchers recognized multiple ways that faculty members could develop expertise, such as observation, reflection, and experience (Steinert et al., 2016). Furthermore, educational and teaching skills can be improved in many ways, such as through mentoring, learner feedback, and online learning. Although there is no one unified and standard educational platform for calibration, a 2019 systematic review and meta-analysis recognized the positive impact and effectiveness of faculty development programs in health institutions (Bilal et al., 2019). Faculty development refers to all of the activities that help educators improve their professional, teaching, and researching skills (including faculty calibration). Researchers suggested that programs be tailored to meet the educational needs of individual institutions (Bilal et al., 2019).

Western Governors University (WGU) tailored its calibration programs to meet the need for continuous and increasing student enrollment and consequently, increased faculty numbers (Gunnell et al., 2016). The WGU Evaluation Department teamed up with the WGU Institutional Research office to develop a homogenous process to train evaluators and ensure inter-rater reliability. The final product consisted of the following components; “ease of use by evaluators, mirroring of the student evaluation experience, calibration on both scoring and feedback, immediate results and coaching to the individual evaluator, reporting at the task level with drill-down to the individual evaluator” (Gunnell et al., 2016, p. 37). By implementing these processes, calibration training was simplified and more efficient.

Multiple methods exist for the successful and effective *implementation* of faculty development programs. Conducting a realist evaluation, researchers discovered five crucial approaches for implementing successful faculty development (Proctor et al., 2020). Accessibility was identified as vital, where faculty development occurs at a suitable time and location for faculty members to attend. Additionally, effective faculty development programs meet the educational needs and are tailored to fit the needs of the institution. Successful programs also foster a supportive learning culture and environment where faculty members feel comfortable and heard. Moreover, productive faculty development programs provide continuing educational development and interactivity where faculty members intermingle through activities and networking. Several mechanisms were also identified by participants as leading to positive faculty development outcomes. Among these mechanisms were engagement in development activities, sense of belonging, perception of the relevance and value of the program, confidence in sharing concerns, and relationship building. Proctor et al. (2020) acknowledged the outcomes of implementing effective faculty development programs. For instance, faculty members had

improved competence and collaboration with one another, and they felt more confident in their educational duties. Though multiple methods exist for successful calibration, the program must be individualized and tailored to the needs of the institution and faculty members. The use of multimedia instruction (MMI) is one way to tailor to the needs of adult learners.

### **Andragogy and Multimedia Instruction**

#### ***Andragogy***

Knowles (1978), a pioneer in adult education and learning, introduced the concept of andragogy, or the study of how adults learn. Prior to this time, there was only one model of the assumptions about learning, the model of pedagogy. Pedagogy describes the art and science of teaching children. Knowles described adult learners as *resistant* to the learning strategies that pedagogy offered. Adult learners seemed to want more than lectures, assigned readings, quizzes, and memorization. Knowles outlined six adult learning tendencies: a) adult learners are self-directed; b) they have vastly growing life experiences that they bring to a situation; c) adults have a desire and willingness to learn; d) adults are very task-oriented and are driven to learn; e) adult learners are focused on the application of what they are learning, and f) they must see the relevance of what they are learning. That is, adult learners have the desire to connect life experiences with the learning environment (Goddu, 2012; Sanger & Pavlova, 2016).

Clinical dental hygiene instructors are self-directed, mature learners and clinical calibration for adult learners should include practical exercises in addition to didactic information (Sanger & Pavlova, 2016). Most clinical instructors lack a background in adult learning theory and methodology, which is a problem when students are adult learners with an average age of 26 (McGuinness, 2016). Requirements set forth by CODA (2022) clearly state a documented background in current educational methodology concepts supporting teaching assignments is mandatory. Although a *minimal* overview of adult learning theory and

methodologies has satisfied CODA in many dental hygiene programs, the effectiveness of the program may be affected if instructors are not better prepared (McGuinness, 2016).

### ***Multimedia Instruction***

Understanding the principles of andragogy helps create multimedia instruction materials to promote practical and self-directed learning. Multimedia Instruction refers to a learning environment that uses visual aids as well as words to foster learning (Mayer, 2009, as cited in Mayer, 2017). Successful MMI for clinical faculty calibration should cement the traditional calibration of checklists and rubrics with problem-solving techniques (McMillan, 2020) and enhance the intellectual processes involved in how adult learners retain information (Issa et al., 2013).

An effectively designed MMI program will help learners recognize relevant information, consider a mental image, and integrate it with prior knowledge. In contrast, a traditional, lecture-only format does not allow mature learners to bring life experiences to the lesson (Goddu, 2012). Multi-media instruction such as online instructional videos provides an excellent means for clinical faculty members to learn correct and effective practices which, in turn, can translate into assisting dental hygiene students in their own learning (McMillan, 2020). Furthermore, online instructional videos for calibration with narration encourage the development of referential connections between what was visually observed with the verbiage used (DiGiacinto, 2007). This research suggested that adult learners may recall more information when videos are accompanied by narration versus with text only, and learners can produce more problem-solving solutions. A 2019 systematic review revealed training with audiovisual media greatly improved hand hygiene techniques for healthcare personnel compared to traditional teaching methods only (Martos-Cabrera et al., 2019). Additionally, DiGiacinto (2007) reported students performed better on outcomes tests when visual information was presented with written information. A

study investigating motion's effect on engagement and learning outcomes revealed full-motion video to be "more engaging, necessary, and interesting" and it led to "increased concentration, focused thoughts, better understanding, and being unaware of their surroundings" (Chen & Thomas, 2020, p. 2155). Issa et al. (2013) provided the first evidence that using MMI for a medical lecture had significant effects on learner long-term retention. A growing body of literature suggests that adult learners have changed the way they learn (Beebe et al., 2014), and calibration activities must change along with it. Beebe and colleagues discovered a variety of MMI tools being used in dental hygiene programs across the United States (2014). Content management systems such as Blackboard, Moodle, and Angel were used mainly for knowledge and reflection; and podcasts, clickers (wireless personal response systems), games, simulations, wiki, and blogs were being used for didactic instruction. Videos were perceived by students as being the most effective learning tool because of the convenience of viewing via personal devices and flexibility allowing access anytime.

Technology is being embraced more by each generation. A study of the effect of instructional videos on faculty calibration proposed technique videos could be an effective means of increasing knowledge including verbiage and technique performance (Carter, 2017). In fact, there was a notable increase in knowledge after viewing the instructional technique video, and the knowledge was sustained after four months. Also, Carter and colleagues suggested that instructional videos for calibration could aid in the consistent use of terminology and sequencing during clinical dental hygiene instruction, and could be the gold standard for calibration. Specifically, studies examining calibration found that calibration should be aimed at achieving a gold standard (Haj-Ali & Feil, 2006; Jacks et al., 2008).

Additionally, an increase in the number of part-time clinical faculty members, diverse responsibilities outside of academia, and most recently, the guidelines for social distancing amidst a pandemic, necessitate a more flexible approach to faculty calibration. Scheduling one in-person calibration presentation is not feasible nor is scheduling multiple, repeated calibration sessions (Woo, 2021). Accommodating all clinical faculty members by providing multiple sessions is both time and labor-intensive. In 2018, one university implemented an online calibration approach using its learning management system, Canvas (Woo, 2021). The goal was to personalize the experience and to make calibration more accessible and convenient for various schedules. Most faculty members were receptive to the online approach even though some faculty members did not take the training seriously. Nevertheless, the online calibration resulted in a more consistent evaluation between faculty members. The University of Florida College of Dentistry (UFCD) offered calibration sessions via electronic media during the COVID-19 pandemic as well (Oliveira et al., 2021). The goal of piloting this faculty calibration electronically was to identify inconsistencies in evaluation between faculty members followed by a plan for recalibration. Soto et al. (2020) met the challenge of certifying competencies across dental disciplines and calibrating faculty during the COVID-19 pandemic by replacing face-to-face exchanges with virtual activities. Improvements in calibration through post-presentation discussions were observed. Also, these virtual discussions opened doors for opportunities that would not have been possible face-to-face, such as holding more activities per day to allow for more students and flexibility of scheduling. Virtual training and calibration sessions have revealed a convenient and cost-effective approach to calibration.

### **Calibration Gaps within Dental Hygiene Education**

Numerous studies confirmed substantial discrepancies in evaluation and clinical decision-making among dental hygiene and dental education faculty (Brame et al., 2017; Dicke et al., 2015; Drucker et al., 2012; Garland & Newell, 2009; Hauser & Bowen, 2009; John et al., 2013; Lane et al., 2015; McGuinness, 2016; Partido, 2017; Santiago et al., 2016). The literature also specifies that students and faculty members want better calibration and training efforts for clinical educators to enable the transfer of clinical skills to students (Belinski & Kanji, 2018; Tabassum et al., 2022). Consequently, efforts have been devoted to identifying effective strategies to improve the level of inter-rater and intra-rater agreement. However, more literature is available exploring faculty calibration in dental education, and very little research is available addressing faculty calibration in dental hygiene education (Dicke, et al., 2015; Garland & Newell, 2009). Furthermore, research is scarce regarding faculty calibration in preclinical dental hygiene courses, and faculty calibration in preclinical dental hygiene is compulsory for students to achieve clinical competence and is essential to effective teaching and learning (Partido et al., 2015).

Knowledge, clinical experience, and advanced degrees are qualifications for a dental hygiene educator and are required by CODA (ADA, 2022). All dental hygiene faculty members are required to have a baccalaureate degree or higher, up-to-date knowledge of the subjects they are teaching, documentation of current educational methodology concepts related to teaching assignments, and evidence of faculty calibration (ADA, 2022). However, when clinicians become educators, much of the knowledge gained in educational methodologies or teaching is by chance or by experience (Kimbrough-Walls, 2012). Although little or no training is offered to new adjunct clinical faculty members (Smethers et al., 2018), they are expected to assume entry-

level teaching positions with aptitude in teaching and evaluation. This results in novice clinical faculty members experiencing job dissatisfaction, frustration, uncertainty, and lack of confidence. In one pilot study, the use of resources such as textbooks, materials, and terminology for preparation was recognized as being helpful for the new faculty members (Smethers et al., 2018). Additionally, one participant responded, “videos of clinical skills would have helped me with all of the assessments we do” (p. 43). However, there is little information in the literature regarding what technology has been implemented in dental hygiene programs and if it is effective or not (Beebe et al., 2014). Additional research examining clinical faculty calibration and the integration of MMI in dental hygiene education is needed.

## **Summary of Chapter 2**

Accreditation standards for dental hygiene programs mandate clinical educators have documentation of backgrounds in educational methodology and evidence of faculty calibration (ADA, 2022). However, research confirms a significant discrepancy in evaluation and decision-making among dental hygiene and dental faculty (Brame et al., 2017; Dicke et al., 2015; Drucker et al., 2012; Garland & Newell, 2009; Hauser & Bowen, 2009; John et al., 2013; Lane et al., 2015; McGuinness, 2016; Partido, 2017; Santiago et al., 2016). Little research exists that investigates effective strategies to increase intra-rater and inter-rater reliability in dental hygiene education (Garland & Newell, 2009). Furthermore, there is little information on the use of MMI for faculty calibration in dental hygiene programs (Beebe et al., 2014). Further research examining faculty calibration and the integration of MMI into dental hygiene education is needed.

The ability to assess student performance accurately and reliably over time is critical to competency-based education (Gunnel et al., 2016). The literature provides us with an

understanding of the detrimental effects of uncalibrated faculty (Dicke et al., 2015; Garland & Newell, 2009; Jacks et al., 2008). If students are not fully prepared to provide quality patient care, they are not prepared for their role as dental hygienists (Carter, 2017). Concentrating on the need for creative and consistent faculty calibration, the focus of this study is to examine the effect of using an online instructional technique video on clinical dental hygienist competency evaluation performance with respect to instrumentation technique.

### Chapter 3 Methodology

The purpose of the study was to determine the effectiveness of video instruction on clinical faculty calibration, reaction to the calibration activities, and impact of the calibration activities. This methodology chapter illustrates the study's design, setting, research sample, data collection, limitations, and statistical analysis.

#### Research Questions/Hypotheses

**Research questions.** The following research questions guided the conduct of this study:

1. Is there a significant difference in post-test instrumentation evaluation scores between the group participating in in-person calibration and the group participating in online calibration?
2. How does the reaction (feelings of confidence as preparedness) of the online calibrated participants compare with the reaction of the in-person calibrated participants?
3. How does the impact (behavioral changes as a result of the calibration) of the online calibrated participants compare with the impact of the in-person calibrated participants?
4. Is there a significant difference in instrument evaluation scores between the pretests before any calibration to retention tests at the end of the semester?
5. Is there a significant difference in online calibrated versus in-person calibrated retention instrument evaluation scores?

**Hypotheses.** The null hypotheses related to this study were:

H0: There will be no statistically significant difference between posttest scores of the evaluation of the 11/12 Explorer (online) and the evaluation of the Gracey 1/2 Curette (in-person).

H0: There will be no statistically significant difference in instrument evaluation scores between the pretests to retention tests.

H0: There will be no statistically significant difference in online calibrated versus in-person calibrated retention instrument evaluation scores.

## **Variables**

The dependent variables were the pretest, posttest, and retention test scores, reaction to the calibration exercises, and the impact of the calibration exercises. The independent variable was the instructional videos.

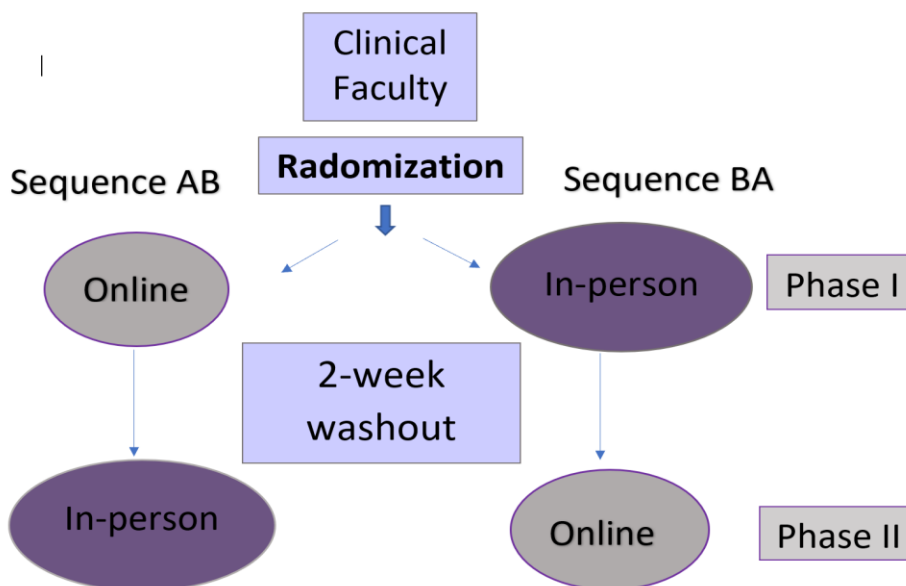
## **Research Design**

The study design was a two-period, two-sequence crossover, AB/BA design (see Figure 1). Participants were randomly assigned to an AB or BA sequence. The group assigned to AB received the online instructional videos for instrumentation for calibration and rubric review in the first phase and after a 2-week washout period, they received, the in-person calibration session with rubric review, in phase II. Likewise, the participants assigned to BA received the in-person calibration session with rubric review in the first phase and after a 2-week washout period, they received the online instructional videos and rubric review in phase II.

The advantage of the cross-over design is each subject acts as their own control, and a smaller number of participants is required in comparison to parallel-group studies (Lim & In, 2021). Additionally, it removes the inter-subject variability from the comparison between groups and the effect of variables that might influence the outcome of the study (Lim & In, 2021).

**Figure 1**

*Two-Period, Two-Sequence Cross-Over Design*



*Note:* Adapted from “Considerations for crossover design in clinical study,” by C. Y. Lim and J. In, 2021 *Korean Journal of Anesthesiology*, 74(4), 293–299.

A pretest was administered to group AB who then observed the provided online instructional videos and participated in a question and discussion forum in Moodle, and then completed a posttest and a questionnaire. A pretest was administered to group BA who then participated in an in-person calibration exercise consisting of discussion, practice, and a question-and-answer (Q&A) period. Following a 2-week washout period, the same procedures were repeated and group AB participated in the in-person discussion, practice, and Q&A, and Group BA viewed the online instructional videos, a crossover design. This study also evaluated the reaction to instructional video use and in-person calibration activities using a Likert scale questionnaire after each calibration activity.

Although there is a discrepancy in the literature about how much time should pass before recalibration, studies have reported that to maintain intra and inter-rater reliability, experts recommend follow-up calibration exercises be offered anywhere from 10 weeks to 1 year after the initial training (McAndrew, 2016). Ten weeks after phase II of the study was complete, all faculty members participated in two retention tests, one for the Gracey ½ Curette and one for the 11/12 Explorer. In addition, two Likert scale impact questionnaires were completed by the participants to evaluate the impact the online and in-person activities had on them. The study was conducted at Idaho State University from August 2022- December 2022.

### **Research Context**

Dental hygiene educators often provide inconsistent instruction and evaluation in clinical settings and a variety of attempts to remedy the lack of consistency have been reported in the literature (Brame et al., 2017). Clinical faculty members at Idaho State University, Department of Dental Hygiene are not exempt from the challenge of inconsistent instruction. Current calibration activities include faculty in-service conferences, usually twice per semester. Additional exercises include 15-minute Q&A discussions among the clinical faculty before the commencement of each pre-clinic session. Years of educational background vary from approximately 1 year to 30 years. This variation in experience or educational background may contribute to the lack of consistency among faculty, which create frustration and confusion for students and become a distraction to learning (Brame et al., 2017). Students have reported a lack of calibration between faculty members and focusing on individual instructors' preferences in order please a particular instructor. All dental hygiene faculty members are required to have documentation of current educational methodology concepts related to teaching assignments, and evidence of faculty calibration (CODA, 2022). Challenges faced when planning calibration

activities include arranging a convenient time when all members can attend, time for calibration activities competing with other important meeting agendas, and preference for calibration delivery (face-to-face versus virtual). Additional barriers to delivering and achieving faculty calibration include subjective factors such as diverse backgrounds, educational levels, and clinical experiences. This study will explore innovative, flexible, and creative ways for faculty calibration via video instruction. The use of self-instructional methods for faculty development has been explored, but not extensively (Brame et al., 2017). Implementation of online, instructional videos to meet the needs of increasing numbers of part-time faculty could prove to be a flexible approach to faculty calibration. Participants in this study will include Idaho State University clinical dental hygiene faculty members.

## **Research Participants**

### ***Sample Description***

A convenience sample consisting of 15 dental hygiene faculty members from the dental hygiene department at Idaho State University was used. The convenience sample chosen represented novice and seasoned clinical dental hygiene faculty who anticipated calibration activities at the beginning of the semester.

**Sample Inclusion Criteria.** Participants of this convenience sample were clinical dental hygiene faculty at Idaho State University who taught at least 4 hours in a preclinic or clinic session during the fall 2022 semester or taught at least 4 hours in a preclinic or clinic session in the past 12 months.

**Sample Exclusion Criteria.** Faculty who were not currently *clinical* faculty members were excluded from the study. Those clinical faculty members who would not be able to attend the in-person control group activities were also excluded.

## **Human Subjects Protection**

In full compliance with relevant laws and regulations, with consideration for participant's protection, safety, and privacy; and in consideration of completing the study ethically, the ISU Human Subjects Committee Application was prepared and submitted for approval. Expedited approval was granted before beginning the study. Participants' confidentiality and anonymity were protected throughout all stages of data collection and analysis. Participants used a pseudonym on all documents for the protection of confidentiality and anonymity. Research participation posed minimal risk to the clinical faculty as the calibration exercises were designed to impart knowledge and the pretest/posttest and questionnaires are designed to assess knowledge of and feelings toward faculty calibration and the use of instructional videos. All data pertaining to this study were stored on password-protected computers. The PI, thesis committee members, and the statistician were the only individuals who had access. Data will be kept for three years and then destroyed according to Idaho State University Policies and Procedures.

## **Data Collection**

### ***Instruments***

To evaluate the goal achievement of the calibration training sessions, the Kirkpatrick Model for Evaluation (Kirkpatrick Partners, 2022), levels one through four (reaction, learning, behavior, and impact), was used to evaluate satisfaction, knowledge gained, knowledge retained, and impact of the program. Table 1 reports the definitions of each level and when and how each level was evaluated.

**Table 1***Kirkpatrick Model Levels Defined*

Kirkpatrick Model Levels	Definition	Evaluation
1. Reaction	The degree to which participants found the calibration activity satisfactory, appealing, and relevant to their profession (Kirkpatrick Partners, 2022)	Evaluation occurred directly after the online instructional video calibration posttest and the in-person calibration activity posttest and was in the form of a questionnaire.
2. Learning	Based on participation, the degree to which participants gained the knowledge, skills, attitudes, and confidence intended (Kirkpatrick Partners, 2022)	Evaluation occurred directly after the online instructional video calibration and the in-person calibration activity in the form of a posttest (evaluation of instrumentation technique using the provided rubric)
3. Behavior	The degree to which participants applied what they learned during the calibration activity (Kirkpatrick Partners, 2022)	Evaluation occurred in the form of retention posttests (evaluation of instrumentation techniques using the provided rubric) 4 weeks after all calibration activities.
4. Results/Impact	The degree to which desired outcomes and behavior changes occurred as a result of the calibration (Kirkpatrick Partners, 2022)	Two impact questionnaires were administered after the retention posttests and evaluated the long-term behavior changes in participants as a result of the calibration activities.

**Grading Rubric:** Pre-existing grading rubrics for evaluation of instrumentation

performance using the Anterior Gracey 1/2 curette and the 11/12 Explorer were used for the pretest, posttest, and retention tests of clinical faculty members. The instrumentation grading rubrics were developed by the dental hygiene faculty in 2015, prior to an accreditation site visit in 2017, and have been validated over time. The pretest and posttest scores were used to evaluate Kirkpatrick levels two and three (learning and behavior). That is, knowledge gained after the activity and retention of knowledge ten weeks after the calibration study is complete were evaluated with the pretest and the posttest.

**Questionnaire:** The link to a Qualtrics-generated questionnaire was available via Moodle to all clinical faculty participants after both in-person and online groups completed the calibration activities. The questionnaire had fourteen areas of evaluation using a 7-point Likert

scale and also collected demographic information. The questionnaire provided information about participant satisfaction (reaction). An impact questionnaire was used after the retention posttest and evaluated the behavior changes (impact) in participants. It had six areas of evaluation using a 7-point Likert scale. Please see Appendix A. Kirkpatrick levels one and four (reaction and results/impact) were evaluated with a questionnaire.

### **Procedure and Protocols**

After receiving approval for the Institutional Review Board (IRB), the content validity and relevance of the self-designed questionnaires were established by utilizing five clinical faculty who have expertise in clinical teaching and were not participating in the study. Content validity is defined as the extent to which components of the assessment instrument are relevant to and representative of a particular assessment purpose (Kirkpatrick Partners, 2022). The first questionnaire was provided directly after the posttest and evaluated level one of the Kirkpatrick Model for evaluation, reaction, which is the degree to which participants found the calibration activity satisfactory, appealing, and relevant to their profession (Kirkpatrick Partners, 2022). The impact questionnaire evaluated level four, impact, which is the degree to which desired outcomes and behavior changes occur as a result of the calibration. Evidence of content validity was represented by the content validity index (CVI). Content validity forms were prepared and provided online to the clinical faculty with expertise in clinical teaching. The experts rated each domain on its degree of relevance (1-4, not relevant to highly relevant). After content validation, each expert's relevance rating was recoded as 1 (relevance scale of 3 or 4) or 0 (relevance scale of 1 or 2) (Yusoff, 2019). Next, the experts in agreement were divided by the number of experts. This provided the item CVI (I-CVI). Items with an I-CVI of .78 or higher for three or more experts could be considered evidence of good content validity (Polit et al., 2007).

An email was sent to potential participants before the start of the fall semester of 2022, informing them of the purpose and logistics of the study. See Appendix B for the email that was sent to potential participants. The email address of the PI was provided for fielding questions. The consent was sent as a fillable pdf form, and participants signed the consent if they chose to participate in the study. Appendix C shows a copy of the full consent form. Participating clinical dental hygiene faculty were randomly assigned to Group AB or Group BA and chose a pseudonym to place on each pretest, posttest, and questionnaire completed for tracking.

This study used a two-group randomized cross-over AB/BA design (see Figure 1) to determine the effect of incorporating online instructional videos into faculty calibration exercises on interrater agreement among dental hygiene faculty. The group assigned to AB received the online instructional videos for the calibration session which included reviewing the 11/12 Explorer instrumentation criteria, viewing correct and improper technique as well as participating in a Moodle discussion forum for a Q&A discussion during the first phase. After a 2-week washout period, Group AB received the in-person calibration session to review the Anterior Gracey 1/2 curette instrumentation criteria, broke out into dyads to model correct and improper technique, and participated in a Q&A discussion in phase II. Likewise, the participants assigned to BA received the in-person activity in the first phase and after a 2-week washout period, they received the online instructional videos for the calibration session in phase II.

For purposes of this study, the gold standard consisted of the evaluation of the 11/12 Explorer (a dental hygiene assessment instrument) and Gracey 1/2 curette (a calculus, or tartar removal instrument) as determined by the private investigator and a co-investigator. The two evaluators standardized on the evaluation of the 11/12 Explorer and the Gracey 1/2 curette during the compilation of the instructional videos and the gold-standard keys for testing. The

gold standard served as the pretests, posttests, and retention tests evaluation keys. Each group completed a pretest (evaluation of instrumentation taking approximately 20 minutes), participated in a calibration activity (calibration session with online video or the comparison calibration session in-person taking approximately 45 minutes), completed an immediate posttest (evaluation of instrumentation taking approximately 20 minutes), and then answered a questionnaire (approximately 10 minutes). The pretests and posttests were identical to one another for each instrument but evaluated instrumentation technique in opposite quadrants of the oral cavity. The retention tests were identical to the post-tests for both instruments. Please see Appendix D for the competency-based evaluation rubrics.

The agenda for Group AB consisted of the pretest instrument evaluation of the 11/12 Explorer (prerecorded simulation of instrumentation in the maxillary right quadrant and was located in Moodle) followed by observation (as many times as desired) of the instructional video (located in Moodle), the posttest instrument evaluation of the 11/12 Explorer (prerecorded simulation of instrumentation in the maxillary left quadrant and located in Moodle), and then the questionnaire. The rubric was provided in Moodle for participants to enter the answers to the test and then submit via Moodle assignment. A Link to the Qualtrics-generated questionnaire was provided in Moodle. Participants had 1 week to complete the tests, activity, and questionnaire. Please see Appendix E for the agenda for Group AB.

The agenda for Group BA consisted of an in-person pretest instrumentation evaluation of the Gracey 1/2 curette (prerecorded simulation instrumentation in the mandibular left quadrant) followed by instructional calibration discussion, Q & A, the posttest instrumentation evaluation of the Gracey 1/2 (prerecorded simulation instrumentation in the mandibular right quadrant), and then the questionnaire. The rubric was provided to participants to enter the answers to the test

and then gathered by the PI. A link to the Qualtrics-generated questionnaire was provided in Moodle. Please see Appendix F for the agenda for Group BA.

Following a two-week washout period, the groups crossed over and Group AB received the in-person calibration session and Group BA received the online calibration session. After completion of phase II, the online instructional videos of the 11/12 Explorer and the Gracey 1/2 curette were available for continuous viewing by all participants. Ten weeks following the final calibration activities and posttests, the retention tests were administered (instrument evaluation of the 11/12 Explorer and the Gracey 1/2 and identical to the posttests from phases I and II). The rubrics were provided in Moodle for participants to enter the answers to the tests and then submit via Moodle assignment. The prerecorded simulation instrumentation for both instruments and the link to the Qualtrics-generated impact rubrics for both online and in-person activities were located in Moodle.

The pretest, posttest, and retention test had 30 points possible. If a mistake was not identified or the satisfactory or unsatisfactory outcome of each criterion was incorrectly identified, that constituted an error on the test. The maximum possible points earned will be 30/30. The participant earned a percentage score on the pretest, posttest, and retention tests.

### **Reliability and Validity**

Pre-existing grading rubrics for evaluation of instrumentation performance for the Anterior Gracey 1/2 curette and the 11/12 Explorer were used for the pretest, posttest, and retention tests of clinical faculty members. These rubrics were developed by the dental hygiene faculty in 2015 and have been validated over time. The pretest and posttest scores were used to evaluate Kirkpatrick levels two and three (learning and behavior), and questionnaires were used to evaluate Kirkpatrick levels one and four (reaction and impact). The validity of the

questionnaire was established by the distribution of an online content validation to experts not participating in the study with clear instructions provided. Lastly, a CVI was calculated and the questionnaire was revised.

### **Limitations**

Limitations of this study included the small sample size and sample of convenience. The convenience sample of clinical faculty members from a single dental hygiene program also limits the generalizability of results. A limitation of using a questionnaire in research is that individuals may answer what they think to be the desired answer. Additionally, crossover trials can present drawbacks. One of the disadvantages is the effects of one treatment may carry over and affect the response to subsequent treatments (Sibbald & Roberts, 1998). The common approach to prevent this is to implement a washout (no treatment) period between consecutive treatments which is long enough to allow the effects of a treatment to wear off. A two-week washout period was used for this study to prevent this carry-over effect.

### **Proposed Statistical Analysis**

Paired samples t-tests were used to evaluate differences between test scores. For the ordinal data (individual Likert-scale questions). Descriptive statistics were used to evaluate differences in reaction to and impact of the online and in-person calibration activities. Alpha will be set at  $p=0.05$ .

### **Summary of Chapter 3**

The purpose of the study was to determine the effectiveness of video instruction on clinical faculty inter-rater reliability and reaction to and impact of the calibration activities. This study used a two-group randomized cross-over AB/BA design. The Kirkpatrick Model of Evaluation was implemented to measure reaction, learning, behavior, and impact. Reaction and

impact of the program were evaluated using questionnaires, and reaction and impact were evaluated using a pretest and a posttest. Results and discussion were reported in the form of a manuscript submitted for publication in the Journal of Dental Education. The submission guidelines may be found at

<https://onlinelibrary.wiley.com/page/journal/19307837/homepage/author-guidelines>

## References

- Amanvermez, Y., Rahmadiana, M., Karyotaki, E., de Wit, L., Ebert, D. D., Kessler, R. C., & Cuijpers, P. (2020). Stress management interventions for college students: A systematic review and meta-analysis. *Clinical Psychology: Science and Practice*.  
<https://doi.org/10.1111/cpsp.12342>
- American Dental Association; Commission on Dental Education (2022). *Accreditation standards for dental hygiene education programs*.
- American Dental Education Association. (July 8, 2016). *ADEA compendium of curriculum guidelines*.  
[https://www.adea.org/ADEA/Blogs/Bulletin\\_of\\_Dental\\_Education/Just\\_Released\\_\\_2015%E2%80%932016\\_ADEA\\_Compendium\\_of\\_Curriculum\\_Guidelines\\_for\\_Allied\\_Dental\\_Education\\_Programs.html](https://www.adea.org/ADEA/Blogs/Bulletin_of_Dental_Education/Just_Released__2015%E2%80%932016_ADEA_Compendium_of_Curriculum_Guidelines_for_Allied_Dental_Education_Programs.html)
- American Dental Hygienists' Association. (May 9, 2016). *National dental hygiene research agenda*. [https://www.adha.org/resources-docs/7111\\_National\\_Dental\\_Hygiene\\_Research\\_Agenda.pdf](https://www.adha.org/resources-docs/7111_National_Dental_Hygiene_Research_Agenda.pdf)
- American Dental Hygienists' Association (2016). *Standards for clinical practice*.  
<https://www.adha.org/resources-docs/2016-Revised-Standards-for-Clinical-Dental-Hygiene-Practice.pdf>
- Badran, A. S., Keraa, K., & Farghaly, M. M. (2022). Applying the Kirkpatrick model to evaluate dental students' experience of learning about antibiotics use and resistance. *European Journal of Dental Education*, 00, 1-11. <https://doi.org/10.1111/eje.12758>

- Beebe, C. R. R., Gurenlian, J. R., & Rogo, E. J. (2014). Educational technology for millennial dental hygiene students: A survey of U.S. dental hygiene programs. *Journal of Dental Education*, 78(6), 838–849. <https://doi.org/10.1002/j.0022-0337.2014.78.6.tb05737.x>
- Belinski, D. E., & Kanji, Z. (2018). Intersections between clinical dental hygiene education and perceived practice barriers. *Canadian Journal of Dental Hygiene*, 52(2), 132–139.
- Bilal, Guraya, S. Y., & Chen, S. (2019). The impact and effectiveness of faculty development program in fostering the faculty's knowledge, skills, and professional competence: A systematic review and meta-analysis. *Saudi Journal of Biological Sciences*, 26(4), 688–697. <https://doi.org/10.1016/j.sjbs.2017.10.024>
- Brame, J. L., AlGheithy, D. S., Platin, E., & Mitchell, S. H. (2017). Use of a self-instructional radiographic anatomy module for dental hygiene faculty calibration. *Journal of Dental Hygiene*, 91(3), 5–13.
- Carr, E., Ennis, R., & Baus, L. (2010). The dental hygiene faculty shortage: Causes, solutions and recruitment tactics. *Journal of Dental Hygiene*, 84(4), 165–169.
- Carter, B. B. (2017). *Faculty calibration with instructional videos for head and neck examinations* [M.S., The University of North Carolina at Chapel Hill].  
<http://www.proquest.com/pqdtglobal/docview/1952165365/abstract/2B28D469E35E4CB3PQ/1>
- Chen, H.-T. M., & Thomas, M. (2020). Effects of lecture video styles on engagement and learning. *Educational Technology Research & Development*, 68(5), 2147–2164.  
<https://doi.org/10.1007/s11423-020-09757-6>

- Davis-Porter, K.-T. (2021). *Transitioning from clinical practitioner to educator within the field of dental hygiene: A phenomenological study* [Ph.D., Liberty University].  
<https://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=4247&context=doctoral>
- Deeb, J. G., Koertge, T. E., Laskin, D. M., & Carrico, C. K. (2019). Are there differences in technical assessment grades between adjunct and full-time dental faculty? A pilot study. *Journal of Dental Education*, 83(4), 451–456. <https://doi.org/10.21815/JDE.019.046>
- Dicke, N. L., Hodges, K. O., Rogo, E. J., & Hewett, B. J. (2015). A survey of clinical faculty calibration in dental hygiene programs. *Journal of Dental Hygiene*, 89(4), 264–273.
- DiGiacinto, D. (2007). Using multimedia effectively in the teaching–learning process. *Journal of Allied Health*, 36(3), 176–179.
- Donovan, K. (2017). *Preparation and Instructional Competency Needs of the new dental hygiene educator: A phenomenological study* [Ed.D., Pepperdine University].  
<http://www.proquest.com/pqdtglobal/docview/1948887533/abstract/55E546FFB4E94498PQ/5>
- Drucker, S. D., Prieto, L. E., & Kao, D. W. K. (2012). Periodontal probing calibration in an academic setting. *Journal of Dental Education*, 76(11), 1466–1473.  
<https://doi.org/10.1002/j.0022-0337.2012.76.11.tb05408.x>
- Ebbeling, S., Adam, L., Meldrum, A., Rich, A., McLean, A., & Aitken, W. (2018). Oral health and dental students' perceptions of their clinical learning environment: A focus group study. *Journal of Dental Education*, 82(10), 1036–1042.  
<https://doi.org/10.21815/JDE.018.102>

- Fitzwater, J., McNeill, J., Monsivais, D., & Nunez, F. (2021). Using simulation to facilitate transition to the nurse educator role: An integrative review. *Nurse Educator*, 46(5), 322–326. <https://doi.org/10.1097/NNE.0000000000000961>
- Forbes, M. O., Hickey, M. T., & White, J. (2010). Adjunct faculty development: Reported needs and innovative solutions. *Journal of Professional Nursing: Official Journal of the American Association of Colleges of Nursing*, 26(2), 116–124. <https://doi.org/10.1016/j.profnurs.2009.08.001>
- Garland, K. V., & Newell, K. J. (2009). Dental hygiene faculty calibration in the evaluation of calculus detection. *Journal of Dental Education*, 73(3), 383–389. <https://doi.org/10.1002/j.0022-0337.2009.73.3.tb04710.x>
- Goddu, K. (2012). Meeting the challenge: Teaching strategies for adult learners. *Kappa Delta Pi Record*, 48(4), 169–173. <https://doi.org/10.1080/00228958.2012.734004>
- Gordon, N. (2013). Learning experiences of oral hygiene students in the clinical environment. *International Journal of Dental Hygiene*, 11(4), 267–272. <https://doi.org/10.1111/idh.12039>
- Gunnell, K. L., Fowler, D., & Colaizzi, K. (2016). Inter-rater reliability calibration program: Critical components for competency-based education. *The Journal of Competency-Based Education*, 1(1), 36–41. <https://doi.org/10.1002/cbe2.1010>
- Haj-Ali, R., & Feil, P. (2006). Rater reliability: Short- and long-term effects of calibration training. *Journal of Dental Education*, 70(4), 428–433. <https://doi.org/10.1002/j.0022-0337.2006.70.4.tb04097.x>
- Henzi, D., Davis, E., Jasinevicius, R., & Hendricson, W. (2007). In the students' own words: What are the strengths and weaknesses of the dental school curriculum? *Journal of*

*Dental Education*, 71(5), 632–645. <https://doi.org/10.1002/j.0022-0337.2007.71.5.tb04320.x>

Henzi, D., Davis, E., Jasinevicius, R., Hendricson, W., Cintron, L., & Isaacs, M. (2005).

Appraisal of the dental school learning environment: The students' view. *Journal of Dental Education*, 69(10), 1137–1147. <https://doi.org/10.1002/j.0022-0337.2005.69.10.tb04015.x>

Hibbert, E. J., Lambert, T., Carter, J. N., Learoyd, D. L., Twigg, S., & Clarke, S. (2013). A

randomized controlled pilot trial comparing the impact of access to clinical endocrinology video demonstrations with access to usual revision resources on medical student performance of clinical endocrinology skills. *BMC Medical Education*, 13(1), 135. <https://doi.org/10.1186/1472-6920-13-135>

Holland, A., Smith, F., McCrossan, G., Adamson, E., Watt, S., & Penny, K. (2013). Online video in clinical skills education of oral medication administration for undergraduate student nurses: A mixed methods, prospective cohort study. *Nurse Education Today*, 33(6), 663–670. <https://doi.org/10.1016/j.nedt.2012.01.006>

Hunt, C. W., Curtis, A. M., & Sanderson, B. K. (2013). A Program to Provide Resources and Support for Clinical Associates. *The Journal of Continuing Education in Nursing*, 44(6), 269–273. <https://doi.org/10.3928/00220124-20130402-27>

Issa, N., Mayer, R. E., Schuller, M., Wang, E., Shapiro, M. B., & DaRosa, D. A. (2013).

Teaching for understanding in medical classrooms using multimedia design principles. *Medical Education*, 47(4), 388–396. <https://doi.org/10.1111/medu.12127>

- Jacks, M. E., Blue, C., & Murphy, D. (2008). Short- and long-term effects of training on dental hygiene faculty members' capacity to write soap notes. *Journal of Dental Education*, 72(6), 719–724. <https://doi.org/10.1002/j.0022-0337.2008.72.6.tb04537.x>
- Kang, I., Foster Page, L. A., Anderson, V. R., Thomson, W. M., & Broadbent, J. M. (2015). Changes in students' perceptions of their dental education environment. *European Journal of Dental Education*, 19(2), 122–130. <https://doi.org/10.1111/eje.12112>
- Kimbrough-Walls, V. J. (2012). *Students' perception of important teaching behaviors in classroom and clinical environments of a community college nursing and dental hygiene education program*. [Ph.D., University of Nevada, Reno].
- Kirkpatrick Partners. (2022). *The Kirkpatrick model*. <https://kirkpatrickpartners.com/the-kirkpatrick-model/>
- Knowles, M. S. (1978). Andragogy: Adult learning theory in perspective. *Community College Review*, 5(3), 9–20. <https://doi.org/10.1177/009155217800500302>
- Korkut, S., Dornberger, R., Diwanji, P., Simon, B. P., & Märki, M. (2015). Success factors of online learning videos. *International Journal of Interactive Mobile Technologies*, 9(4), 17–22. <https://doi.org/10.3991/ijim.v9i4.4460>
- La Chimea, T., Kanji, Z., & Schmitz, S. (2020). Assessment of clinical competence in competency-based education. *Canadian Journal of Dental Hygiene*, 54(2), 83–91.
- Lim, C.-Y., & In, J. (2021). Considerations for crossover design in clinical study. *Korean Journal of Anesthesiology*, 74(4), 293–299. <https://doi.org/10.4097/kja.21165>
- Lanning, S. K., Best, A. M., Temple, H. J., Richards, P. S., Carey, A., & McCauley, L. K. (2006). Accuracy and consistency of radiographic interpretation among clinical

- instructors in conjunction with a training program. *Journal of Dental Education*, 70(5), 545–557. <https://doi.org/10.1002/j.0022-0337.2006.70.5.tb04110.x>
- Lanning, S. K., Pelok, S. D., Williams, B. C., Richards, P. S., Sarment, D. P., Oh, T.-J., & McCauley, L. K. (2005). Variation in periodontal diagnosis and treatment planning among clinical instructors. *Journal of Dental Education*, 69(3), 325–337. <https://doi.org/10.1002/j.0022-0337.2005.69.3.tb03919.x>
- Lyle, D. M., Olmsted, J., & Rothen, M. (2016). National dental hygiene research agenda. *The Journal of Dental Hygiene*, 90, 8.
- Martos-Cabrera, M. B., Mota-Romero, E., Martos-García, R., Gómez-Urquiza, J. L., Suleiman-Martos, N., Albendín-García, L., & Cañadas-De la Fuente, G. A. (2019). Hand hygiene teaching strategies among nursing staff: A systematic review. *International Journal of Environmental Research and Public Health*, 16(17), 3039. <https://doi.org/10.3390/ijerph16173039>
- Mayer, R. e. (2017). Using multimedia for e-learning. *Journal of Computer Assisted Learning*, 33(5), 403–423. <https://doi.org/10.1111/jcal.12197>
- McAndrew, M. (2016). Faculty calibration: Much ado about something. *Journal of Dental Education*, 80(11), 1271–1272. <https://doi.org/10.1002/j.0022-0337.2016.80.11.tb06211.x>
- McGuinness, M. A. (2016). *Adult learning-focused professional development for dental hygiene clinical instructors* [Ph.D., Waldon University]. <https://core.ac.uk/download/pdf/147834417.pdf>
- McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia Medica*, 22(3), 276–282.

- McMillan, J. L. (2020). *Participation in an online faculty development program to support novice nursing faculty* [Ph.D., Northern Arizona University].  
<http://www.proquest.com/pqdtglobal/docview/2412268816/abstract/D5C5051CA404478FPQ/1>
- Oliveira, D., Guha, U., Delgado, A., & Ribeiro, A. P. (2021). Overcoming the emerging challenges in faculty calibration in times of COVID-19 pandemic. *Journal of Dental Education*, 85(S1), 1078–1079. <https://doi.org/10.1002/jdd.12516>
- Park, R. D., Susarla, S. M., Howell, T. H., & Karimbux, N. Y. (2009). Differences in clinical grading associated with instructor status. *European Journal of Dental Education*, 13(1), 31–38. <https://doi.org/10.1111/j.1600-0579.2008.00534.x>
- Partido, B. B. (2017). Ergonomics calibration training utilizing photography for dental hygiene faculty members. *Journal of Dental Education*, 81(10), 1187–1193.  
<https://doi.org/10.21815/JDE.017.078>
- Partido, B. B., Jones, A. A., English, D. L., Nguyen, C. A., & Jacks, M. E. (2015). Calculus detection calibration among dental hygiene faculty members utilizing dental endoscopy: A pilot study. *Journal of Dental Education*, 79(2), 124–132.  
<https://doi.org/10.1002/j.0022-0337.2015.79.2.tb05866.x>
- Paulis, M. R. (2011). Comparison of dental hygiene clinical instructor and student opinions of professional preparation for clinical instruction. *Journal of Dental Hygiene*, 85(4), 297–305.
- Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health*, 30(4), 459–467. <https://doi.org/10.1002/nur.20199>

- Proctor, D., Leeder, D., & Mattick, K. (2020). The case for faculty development: A realist evaluation. *Medical Education*, 54(9), 832–842. <https://doi.org/10.1111/medu.14204>
- Rezaei, B., Falahati, J., & Beheshtizadeh, R. (2020). Stress, stressors and related factors in clinical learning of midwifery students in Iran: A cross sectional study. *BMC Medical Education*, 20, 78. <https://doi.org/10.1186/s12909-020-1970-7>
- Roberts, K. K., Chrisman, S. K., & Flowers, C. (2013). The perceived needs of nurse clinicians as they move into an adjunct clinical faculty role. *Journal of Professional Nursing*, 29(5), 295–301. <https://doi.org/10.1016/j.profnurs.2012.10.012>
- Rogers, J. L., Dunn, L. R., & Lautar, C. J. (2008). Training health care providers to be educators. *The health care manager*, 27(1), 40–44.  
<https://doi.org/10.1097/01.hcm.0000285029.79762.e8>
- Russell, L. S. (2016). *Converting clinician to educator: Preparation for dental education by continuing professional education* [Ed.D., The University of Memphis]. Retrieved June 21, 2022, from <http://www.proquest.com/pqdtglobal/docview/1887114951/abstract/8C12D2B7BB194E67PQ/1>
- Sahi, P. K., Mishra, D., & Singh, T. (2020). Medical education amid the COVID-19 pandemic. *Indian Pediatrics*, 57(7), 652–657.
- Sanger, P. A., & Pavlova, I. V. (2016). Applying andragogy to promote active learning in adult education in Russia. *International Journal of Engineering Pedagogy (IJEP)*, 6(4), 41. <https://doi.org/10.3991/ijep.v6i4.6079>
- Santiago, L. J., Freudenthal, J. J., Peterson, T., & Bowen, D. M. (2016). Dental hygiene faculty calibration using two accepted standards for calculus detection: A pilot study. *Journal of*

- Dental Education*, 80(8), 975–982. <https://doi.org/10.1002/j.0022-0337.2016.80.8.tb06178.x>
- Seabra, R. C., Costa, F. O., Costa, J. E., Van Dyke, T., & Soares, R. V. (2008). Impact of clinical experience of the accuracy of probing depth measurements. *Quintessence International* (Berlin, Germany: 1985), 39(7), 559–565.
- Shah, S. (2020). The technological impact of COVID-19 on the future of education and health care delivery. *Pain Physician*, 4S;23(8;4S), S367–S380. <https://doi.org/10.36076/ppj.2020/23/S367>
- Sharaf, A. A., AbdelAziz, A. M., & El Meligy, O. A. S. (2007). Intra-and inter-examiner variability in evaluating preclinical pediatric dentistry operative procedures. *Journal of Dental Education*, 71(4), 540–544. <https://doi.org/10.1002/j.0022-0337.2007.71.4.tb04307.x>
- Smethers, R. D., Smallidge, D. L., Giblin-Scanlon, L. J., & Perry, K. R. (2018). Experiences and challenges of clinical dental hygienists transitioning into teaching roles. *Journal of Dental Hygiene*, 92(6), 40–46.
- Soto, A., Johnson, M., & Echeto, L. F. (2021). Clinical competency, faculty calibration, and virtual activity for treatment planning and prosthodontics: How to get it all in one conference call. *Journal of Dental Education*, 85(S1), 1074–1075. <https://doi.org/10.1002/jdd.12398>
- Steedman, M., Abouammoh, M., & Sharma, S. (2012). Multimedia learning tools for teaching undergraduate ophthalmology: Results of a randomized clinical study. *Canadian Journal of Ophthalmology*, 47(1), 66–71. <https://doi.org/10.1016/j.jcjo.2011.12.006>

- Steinert, Y., Mann, K., Anderson, B., Barnett, B. M., Centeno, A., Naismith, L., Prideaux, D., Spencer, J., Tullo, E., Viggiano, T., Ward, H., & Dolmans, D. (2016). A systematic review of faculty development initiatives designed to enhance teaching effectiveness: A 10-year update: BEME Guide No. 40. *Medical Teacher*, 38(8), 769–786.  
<https://doi.org/10.1080/0142159X.2016.1181851>
- Tabassum, A., Alhareky, M., Madi, M., & Nazir, M. A. (2022). Attitudes and satisfaction of dental faculty toward calibration: A cross-sectional study. *Journal of Dental Education*, n/a(n/a), 1–7. <https://doi.org/10.1002/jdd.12890>
- Tax, C. L., Doucette, H., Neish, N. R., & Maillet, J. P. (2012). A model for cultivating dental hygiene faculty development within a community of practice. *Journal of Dental Education*, 76(3), 311–321. <https://doi.org/10.1002/j.0022-0337.2012.76.3.tb05260.x>
- Tucker, C. S., Efurd, M. G., & Kennedy, R. L. (2018). Impact of implementing a competency-based clinical curriculum: Transitioning a dental hygiene program. *Journal of Allied Health*, 47(1), 9E-15E.
- Woo, D. A. (2021). An innovative online approach to clinical faculty calibration. *Journal of Dental Education*, 85(S1), 1059–1061. <https://doi.org/10.1002/jdd.12244>
- Xu, X., Xie, Q., Zhou, Y., Wu, L., & Cao, Y. (2020). Effect of a standardized training with digital evaluation on the improvement of prosthodontic faculty's performance in crown preparation: A pre-post design. *Journal of Prosthodontics*, 29(9), 766–771.  
<https://doi.org/10.1111/jopr.13222>
- Yazdankhahfard, M., Ravanipour, M., & Mirzaei, K. (2020). The gap in the clinical learning environment: The viewpoints of nursing students. *Journal of Education and Health Promotion*, 9, 311. [https://doi.org/10.4103/jehp.jehp\\_438\\_20](https://doi.org/10.4103/jehp.jehp_438_20)

Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation.

*Education in Medicine Journal*, 11(2), 49–54. <https://doi.org/10.21315/eimj2019.11.2.6>

## Appendix A Questionnaires

### Questionnaire 1 with demographics

Calibration activity reporting (circle one):    in-person       online

	1=Completely Disagree	2=Mostly Disagree	3=Somewhat Disagree	4=Neither Agree or Disagree	5=Somewhat Agree	6=Mostly Agree	7=Completely Agree
<b>Reaction</b>							
Overall, I was satisfied with the training provided							
The calibration session was an effective use of my time							
The course covered essential material							
I was satisfied with the training style							
I feel more confident in my abilities to thoroughly and accurately evaluate student performance							
I feel more confident in my abilities to verbalize instrumentation feedback to students							
I feel more confident in my abilities to identify student strengths and weaknesses related to instrumentation							
I feel more confident in my abilities to use the evaluation rubric							

I feel assured that I will be able to help students feel confident and able							
There are still concepts of student evaluation that I do not understand							
The calibration session fostered a supportive learning environment where I felt comfortable and heard							
I feel as though I have sufficient resources to guide me in evaluation of student instrumentation performance							
I feel as though I have had sufficient instruction to evaluate student instrumentation performance							
I feel prepared for clinical teaching of dental hygiene instrumentation							

## DEMOGRAPHICS

1. Age? \_\_\_\_\_
2. Years as a licensed dental hygienist? \_\_\_\_\_
3. Years teaching full time at Idaho State University and at another institution? \_\_\_\_\_
4. Years teaching as a clinical faculty member in preclinic? \_\_\_\_\_
5. Years teaching as a clinical faculty member in senior clinic? \_\_\_\_\_
6. Years teaching in junior clinic? \_\_\_\_\_
7. Highest degree earned? \_\_\_\_\_
8. Years of full-time clinical practice experience? \_\_\_\_\_
9. Years of part-time clinical practice experience? \_\_\_\_\_

## Impact Questionnaire

Calibration activity reporting (circle one):    in-person    online

	1=Completely Disagree	2=Mostly Disagree	3=Somewhat Disagree	4=Neither Agree or Disagree	5=Somewhat Agree	6=Mostly Agree	7=Completely Agree
<b>Impact</b>							
I have used what I learned in the calibration activity to accurately evaluate student performance							
I have used what I learned in the calibration activity to verbalize instrumentation feedback for students							
I have used what I learned in the calibration activity to identify student strengths and weaknesses							
I continue to use the resources provided to me to guide me in evaluation of student performance							
I am evaluating students more thoroughly since the calibration exercise							
I am evaluating students more accurately since the calibration exercise							
I am having more positive and effective interaction with students since the calibration exercise							

## **Appendix B**

### **Recruitment Email**

Dear colleagues,

I am completing a research study on the effectiveness of instructional video on intra-rater and inter-rater reliability, feelings of confidence, and feelings of preparedness. The goal is to have as many participants as possible from Idaho State University department of dental hygiene. To qualify, you must be working at least 4 hours in preclinic or clinic during the fall semester of 2022, and be able to attend the in-person calibration session on August 19, 2022, 2-4pm or on September 9, 2022, 1-3pm (depending on which group you would be randomized to).

Participating clinical dental hygiene faculty will be randomly assigned to Group AB or Group BA and will choose a pseudonym to place on each pretest, posttest, and questionnaire completed for tracking.

This study will use a two-group randomized cross-over AB/BA design to determine the effect of incorporating online instructional videos into faculty calibration exercises on intra-rater and interrater agreement among dental hygiene faculty. The group assigned to AB will receive the independent variable, or the online instructional videos for the calibration session which includes reviewing the 11/12 Explorer instrumentation criteria, viewing correct and improper technique as well as participating in a Moodle discussion forum for a Q&A discussion during the first phase. After a 2-week washout period, they will receive the comparison, which consists of an in-person calibration session to review the Anterior Gracey 1/2 curette instrumentation criteria, break into dyads to model correct and improper technique, and participate in a Q&A discussion in phase II. Likewise, the participants assigned to BA will receive the in-person comparison in the first phase and after a 2-week washout period, they will receive the online instructional videos for the calibration session in phase II.

The agenda for Group AB will consist of the pretest instrument evaluation of the 11/12 Explorer (prerecorded simulation of instrumentation in one quadrant located in Moodle) followed by observation (as many times as desired) of the instructional video (located in Moodle), the posttest instrument evaluation of the 11/12 Explorer (prerecorded simulation of instrumentation in one quadrant located in Moodle), and then questionnaire. Links to the

Qualtrics generated rubric evaluation form and the questionnaire will be located in Moodle. Participants will have 1 week to complete the tests, activity, and questionnaire. Please see

The agenda for Group BA will consist of an in-person pretest instrumentation evaluation of the Gracey 1/2 curette (prerecorded simulation instrumentation in one quadrant) followed by instructional calibration discussion, Q & A, the posttest instrumentation evaluation of the Gracey 1/2 (prerecorded simulation instrumentation in one quadrant), and then the questionnaire. Links to the Qualtrics generated rubric evaluation form and the questionnaire will be located in Moodle.

Following a two-week washout period, the groups will cross over and Group AB will then receive the comparison in-person calibration session and Group BA will receive the online calibration session. Four weeks following the initial calibration activities and posttests, the retention tests will be administered (instrument evaluation of the 11/12 Explorer and the Gracey 1/2). The prerecorded simulation instrumentation in one quadrant and the links to the Qualtrics-generated evaluation rubrics will be located in Moodle.

There are no foreseeable risks/discomforts with this study. However, there may be risks or discomforts that are currently unforeseeable at this time. We will notify participants about any significant new information we learn that may relate to your willingness to continue participating in this study.

Please send any questions you might have to Camille, [camillebiorn@isu.edu](mailto:camillebiorn@isu.edu), and please sign and return the consent form to [camillebiorn@isu.edu](mailto:camillebiorn@isu.edu) if you consent to participation.

Sincerely,

Camille M Biorn, RDH, BS

## **Appendix C**

### **Human Subjects Committee Informed Consent Form**

You are asked to participate in a research study conducted by Camille M Biorn, RDH, BS, a graduate student from the Department of Dental Hygiene at Idaho State University. The Human Subject's Committee at Idaho State University has reviewed and approved this research project.

You have been asked to participate in this research study because you are a clinical dental hygiene faculty member at Idaho State University. Your participation in this research project is completely voluntary and you may leave the study at any time. You will not receive any monetary benefits from this study; however, you will receive continuing education credits. Please read the important information about the study below and ask any questions about anything you do not understand, before deciding whether or not to participate.

#### **PURPOSE OF THE STUDY**

The purpose of this study is to determine the effectiveness of instructional videos on faculty calibration and the feelings of confidence and preparedness.

#### **PROCEDURES**

If you volunteer to participate in this study, you are asked to complete the following procedures:

- ❖ Before formally agreeing to participate in the study, this consent is provided to you to read and understand. Any and all of your questions regarding the purpose and procedures of the study will be answered prior to signing the informed consent.
- ❖ Your consent and participation will include being randomly assigned to one of two groups. The first group will be the intervention group and you will be asked to take a pretest, evaluating instrumentation technique on a prerecorded video using the provided rubric

(approximately 20 minutes). Afterward, you will be asked to view an instructional video (approximately 45 minutes) and take a similar posttest (approximately 20 minutes). A questionnaire will be provided and will ask some questions about your experience (approximately 10 minutes). The instructional video will be available in Moodle. The pretest, posttest, and questionnaire will also be available in Moodle as Qualtrics links. You will have one week to complete the activities.

- ❖ The second group that you may be randomly assigned to is the comparison group. All of the activities will be in person on one designated day. If you are assigned to this group, you will be asked to watch a prerecorded simulation competency-based evaluation video and evaluate instrumentation technique using the provided rubric (approximately 20 minutes). Afterward, you will be asked to participate in an in-person calibration discussion activity (approximately 45 minutes) and then take a similar posttest (approximately 20 minutes). A questionnaire will be provided to ask some questions about your experience (approximately 10 minutes).
- ❖ Next, the test and control groups will switch assignments (test or comparison) and the same procedures described above will be followed.
- ❖ Ten weeks after the completion of the posttest, a retention test will be administered. This test will be located in Moodle and will consist of evaluating instrumentation technique on two prerecorded videos using the provided rubrics located in Moodle via Qualtrics Links.
- ❖ The collected data will be sent to the dental hygiene program designated statistician and analyzed for the purpose of the research. Your privacy will be protected confidentially, and your personal information will be removed from all data.

**POTENTIAL RISKS**

There are no foreseeable risks/discomforts with this study. However, there may be risks or discomforts that are currently unforeseeable at this time. We will tell you about any significant new information we learn that may relate to your willingness to continue participating in this study.

**ANTICIPATED BENEFITS TO PARTICIPANTS**

Participation may foster critical thinking and enhance your analytical skills.

**ANTICIPATED BENEFITS TO SOCIETY**

The anticipated benefits to society through this research are to the profession of dental hygiene and to the clinical dental hygiene faculty of the future. Information about the effectiveness of instructional video on calibration can add new evidence to the body of knowledge regarding faculty calibration.

**PRIVACY AND CONFIDENTIALITY**

The only people who will know that you are a research participant is the researcher, your participant peers, and the thesis co-chairpersons. None of your information, nor the data collected from you, will be disclosed to others without your written permission, except if required by law.

**PARTICIPATION AND WITHDRAWAL**

Your participation in this research is VOLUNTARY. If you decide to participate, you are at liberty to withdraw your consent and discontinue participation at any time without prejudice or penalties associated with your withdrawal. All you need to say is that you no longer wish to participate.

The principal investigator may withdraw you from participating in the research study IF

circumstances arise which warrant doing so. Such as, if you do not participate in the “Procedures” outlined in the above section, and you will be notified by mail of your withdrawal.

### **IDENTIFICATION OF THE INVESTIGATOR**

#### **Investigator**

Camille M. Biorn, RDH, BS

Phone: 208.317.1078

Email: camillebiorn@isu.edu

#### **Faculty Thesis Committee Members**

Ellen Rogo RDH, PhD

Professor and Associate Dean of Curriculum & Assessment

Phone: 208.251-2940

Email: ellenrogo@isu.edu

Rachelle Williams, RDH-EA, MS

Assistant Professor & Senior Clinic Coordinator

Phone: 208.282-2395

Email: rachellewilliams@isu.edu

I have read the information provided above. I have been given an opportunity to ask questions, and all my questions have been answered to my satisfaction. I have been given a copy of the informed consent form. I give my consent for the results of the research to be published or

discussed after my personal information or any other identifier has been removed so that no information will be included that would reveal my identity.

I HAVE REVIEWED THIS CONSENT FORM AND UNDERSTAND AND AGREE TO ITS CONTENTS.

---

Printed Name of Participant

---

Signature of Research Participant

---

Date

---

Signature of Investigator

---

Date

---

Chosen pseudonym (to be used as the name on each pretest, posttest, and questionnaire)

## Appendix D

### Competency-Based Education Forms

#### Anterior Gracey CBE

The evaluator will indicate the tooth #, surface, and error under the appropriate criteria. The greyed-out areas will not be evaluated for the purpose of this exercise.

Criteria	Errors	Satisfactory or Unsatisfactory
Instrument is <b>sharp</b> (all cutting edges)	Either S (sharp) or U (not sharp)	
Procedure is completed without excessive discomfort to patient or excessive manipulation of tissues	Excessive discomfort or excessive manipulation of tissue in any area is an unsatisfactory	
Follows proper <b>infection control</b> procedures throughout the procedure including appropriate clinician PPE	Unsatisfactory if any infection control procedures are not followed correctly	
Demonstrates <b>safety</b> during assessment procedure (patient eyewear, no flipping the instrument over the patient's face or body, etc)	Satisfactory if safety measures followed Unsatisfactory if not followed	
<b>Efficiency</b> is demonstrated	Satisfactory for efficiency Unsatisfactory for not efficient	
Criteria	Errors <b>TWO ALLOWABLE ERRORS PER CRITERIA</b>	Satisfactory or Unsatisfactory
Assumes proper patient/operator <b>positioning</b> <ul style="list-style-type: none"> <li>• Proper height</li> <li>• Proper clock position</li> <li>• Weight is evenly distributed on both hips</li> <li>• Assumes a neutral position with proper posture to avoid discomfort or injury</li> <li>• Asks patient to adjust head to increase illumination and accessibility</li> </ul>		

<b>Illumination</b> is satisfactory <ul style="list-style-type: none"> <li>Each surface (DB, B, MB, DL, L, ML) are adequately illuminated for visibility and safety</li> </ul>		
Demonstrates proper use of <b>mirror</b> during procedure. <ul style="list-style-type: none"> <li>Retraction and visibility are adequate</li> <li>Mirror is not causing potential discomfort to the patient</li> <li>Mirror is stable</li> <li>Indirect illumination is applied where indicated</li> <li>Indirect vision is applied where indicated</li> </ul>		
Demonstrates an effective modified pen <b>grasp</b> in each area. <ul style="list-style-type: none"> <li>Index finger and thumb are across from one another and not touching</li> <li>Handle rests between joint of index finger and joint where the finger and hand meet.</li> <li>Grasp is c-shaped and relaxed</li> <li>Grasp is not split</li> </ul>		
Demonstrates an appropriate <b>fulcrum</b> in each area. <ul style="list-style-type: none"> <li>Uses a built-up fulcrum.</li> <li>Conventional fulcrum is used most of the time</li> <li>Finger rest is maintained on the occlusal or incisal edge</li> </ul>		
uses correct <b>working end</b> of instrument on each surface; DF, F, MF, DL, L, ML		
<b>Inserts</b> to the junctional epithelium using the terminal 1-2 mm at the appropriate location <ul style="list-style-type: none"> <li>Reinsertion is overlapping</li> <li>Insertion is gentle.</li> </ul>		
<b>Distal aspect:</b> <ul style="list-style-type: none"> <li>Establishes a 70–80-degree angulation</li> </ul>		

<ul style="list-style-type: none"> <li>• Activates using controlled vertical/oblique strokes</li> <li>• Uses a wrist rock and in the correct direction</li> <li>• Short 1-2mm strokes are employed</li> <li>• Strokes extend from the epithelial attachment to the gingival margin</li> <li>• Rock, roll, and pivot occur continuously</li> <li>• Extends to the midline of the proximal surface</li> </ul>		
<b>Buccal and Lingual:</b> <ul style="list-style-type: none"> <li>• Establishes 70–80-degree angulation</li> <li>• Activates using controlled vertical/oblique strokes</li> <li>• Uses a wrist rock and in the correct direction</li> <li>• Short 1-2mm strokes are employed</li> <li>• Strokes extend from the epithelial attachment to the gingival margin</li> <li>• Rock, roll, and pivot occur continuously</li> </ul>		
<b>Mesial Aspect:</b> <ul style="list-style-type: none"> <li>• Establishes 70–80-degree angulation</li> <li>• Activates using controlled vertical/oblique strokes</li> <li>• Uses a wrist rock and in the correct direction</li> <li>• Short 1-2mm strokes are employed</li> <li>• Strokes extend from the epithelial attachment to the gingival margin</li> <li>• Rock, roll, and pivot occur continuously</li> <li>• Extends to the midline of the proximal surface</li> </ul>		
<b>Effective calculus removal</b>		

<ul style="list-style-type: none"> <li>• Uses channeling when needed</li> <li>• engages beneath deposit</li> <li>• Applies appropriate light-moderate lateral pressure</li> <li>• maintains a 70–80-degree angulation</li> </ul>		
--	--	--

### 11/12 Explorer CBE

The evaluator will indicate the tooth #, surface, and error under the appropriate criteria. The greyed-out areas will not be evaluated for the purpose of this exercise.

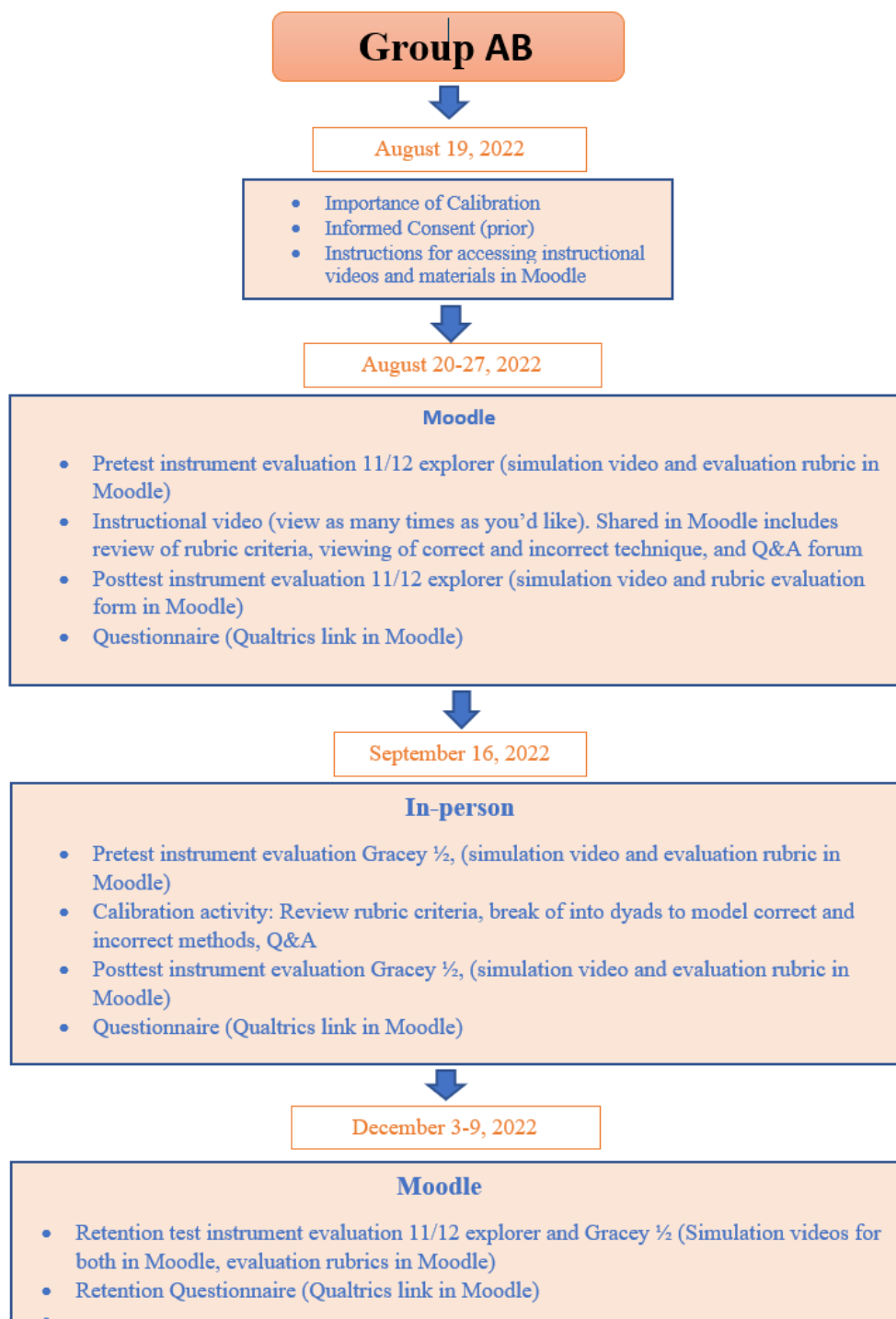
Criteria	Errors	Satisfactory or Unsatisfactory
Procedure is completed without excessive discomfort to patient or excessive manipulation of tissues.	Excessive discomfort or excessive manipulation of tissue in any area is an unsatisfactory	
Follows proper <b>infection control</b> procedures throughout the procedure including appropriate clinician PPE	Unsatisfactory if any infection control procedures are not followed correctly	
Demonstrates <b>safety</b> during assessment procedure (patient eyewear, no flipping the instrument over the patient's face etc).	Satisfactory if safety measures followed Unsatisfactory if not followed	
<b>Efficiency</b> is demonstrated	Satisfactory for efficiency Unsatisfactory for not efficient	
Criteria	Errors TWO ALLOWABLE ERRORS PER CRITERIA	Satisfactory or Unsatisfactory
Assumes proper patient and operator <b>position</b> <ul style="list-style-type: none"> <li>• Proper height</li> <li>• Proper clock position</li> <li>• Weight is evenly distributed on both hips</li> <li>• Assumes a neutral position with proper posture to avoid discomfort or injury</li> </ul>		

<ul style="list-style-type: none"> <li>Asks patient to adjust head to increase illumination and accessibility</li> </ul>		
<p><b>Illumination</b> is satisfactory</p> <ul style="list-style-type: none"> <li>Each surface (DB, B, MB, DL, L, ML) are adequately illuminated for visibility and safety</li> </ul>		
<p>Demonstrates proper use of <b>mirror</b> during procedure</p> <ul style="list-style-type: none"> <li>Retraction and visibility are adequate.</li> <li>Mirror is not causing potential discomfort to the patient</li> <li>Mirror is stable</li> <li>Indirect illumination is applied where indicated</li> <li>Indirect vision is applied where indicated</li> </ul>		
<p>Demonstrates an effective modified pen <b>grasp</b> in each area</p> <ul style="list-style-type: none"> <li>Index finger and thumb are across from one another and not touching</li> <li>Handle rests between joint of index finger and joint where the finger and hand meet</li> <li>Grasp is relaxed and C-shaped</li> <li>Grasp is not split</li> </ul>		
<p>Demonstrates an appropriate <b>fulcrum</b> in each area</p> <ul style="list-style-type: none"> <li>Uses a built-up fulcrum</li> <li>Conventional fulcrum is used</li> <li>Finger rest is maintained on the occlusal or incisal edge</li> <li>*Palm down is used on #1, #2, and distal of #3</li> </ul>		
<p>Uses <b>correct working end</b> of explorer on each surface; DF, F, MF, DL, L, ML</p>		
<p><b>Inserts</b> to the junctional epithelium using the terminal 1-2</p>		

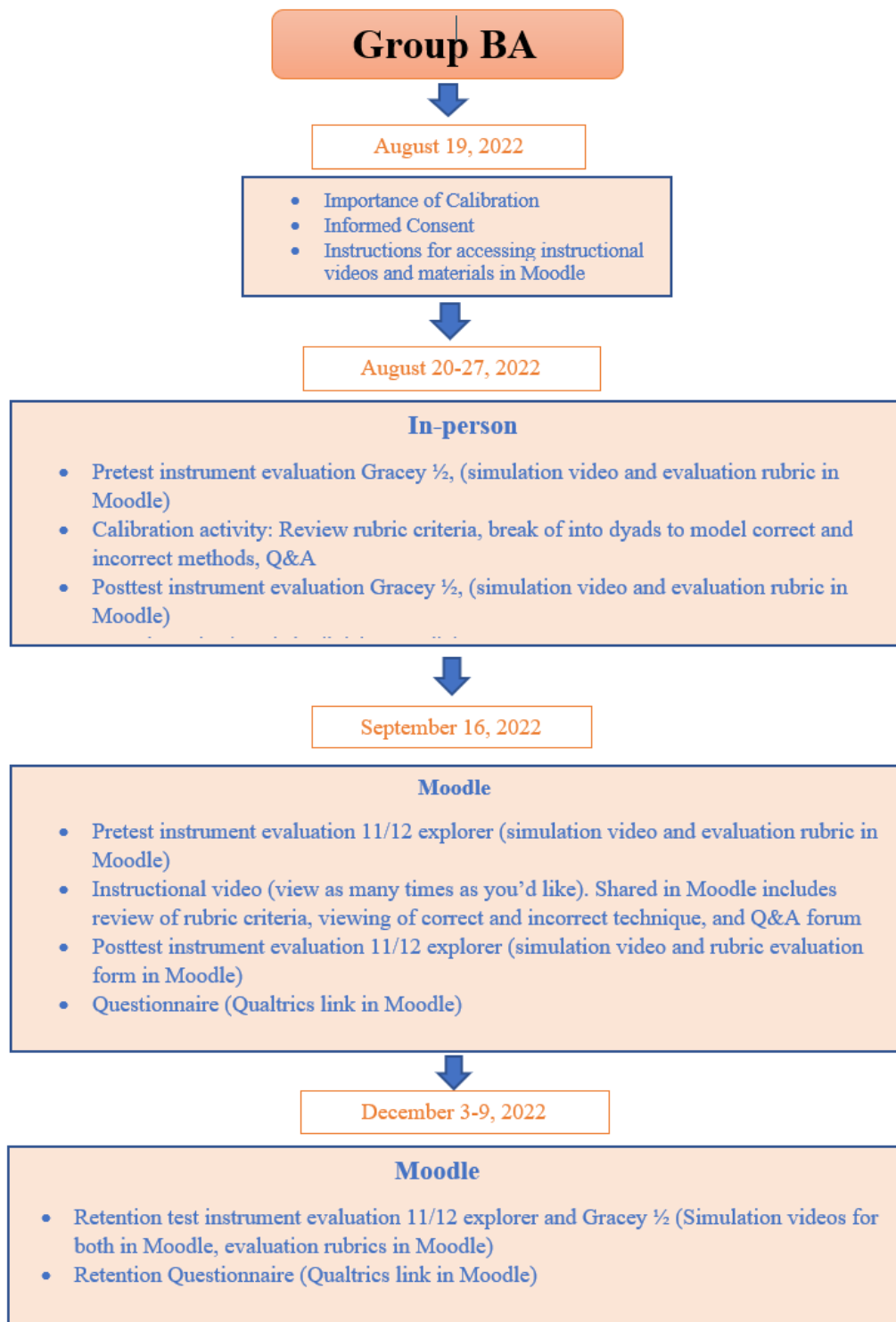
mm at the appropriate location (midline vs. line angle), and reinserts overlapping the first insertion. Insertion is gentle.		
<b>Distal Aspect:</b> <ul style="list-style-type: none"> <li>• Establishes angulation and activates controlled, overlapping vertical/oblique strokes</li> <li>• Uses a wrist rock and in the correct direction</li> <li>• Short (1-2mm) strokes are employed</li> <li>• Strokes extend from the gingival margin to the epithelial attachment</li> <li>• Rock, roll, and pivot occur continuously</li> <li>• Strokes extend to the midline of the distal surface</li> </ul>		
<b>Buccal/Lingual surfaces</b> <ul style="list-style-type: none"> <li>• Establishes angulation and activates controlled, overlapping vertical/oblique strokes</li> <li>• Uses a wrist rock and in the correct direction.</li> <li>• Strokes extend from the gingival margin to the epithelial attachment.</li> <li>• Rock, roll, and pivot occur continuously.</li> </ul>		
<b>Mesial Aspect:</b> <ul style="list-style-type: none"> <li>• Establishes angulation and activates controlled, overlapping vertical/oblique strokes</li> <li>• Uses a wrist rock and in the correct direction.</li> <li>• Strokes extend from the gingival margin to the epithelial attachment</li> <li>• Rock, roll, and pivot occur continuously</li> </ul>		

<ul style="list-style-type: none"><li>• Strokes extend to the proximal of the mesial surface</li></ul>		
--	--	--

## Appendix E Agenda Group AB



## Appendix F Agenda Group BA



## **Effectiveness of Online Faculty Calibration**

Camille M Biorn, RDH, MS, Ellen J. Rogo, RDH, PhD, Rachelle Williams, RDH-EA, MS

### **Affiliations**

Camille M Biorn is an Assistant Professor and Junior Clinic Coordinator in the Department of Dental Hygiene at Idaho State University. Ellen Rogo is a Professor in the Department of Dental Hygiene and Associate Dean of Curriculum and Assessment in the College of Health at Idaho State University. Rachelle Williams is an Assistant Professor and Senior Clinic Coordinator in the Department of Dental Hygiene at Idaho State University.

### **Author Responsible for Correspondence**

Camille M Biorn  
921 South 8th Avenue Stop 8048/ Pocatello, ID 83209  
(208) 282-3796  
camillebiorn@isu.edu

## Effectiveness of Online Faculty Calibration

### ABSTRACT:

**Purpose:** This study investigated the effectiveness of online video instruction compared to an in-person session on clinical faculty calibration-

**Methods:** A crossover AB/BA research design was utilized to evaluate online and in-person faculty calibration. Fifteen faculty members from a baccalaureate dental hygiene program were randomly assigned to an AB or BA sequence for calibration activities on two different instruments. Following a 2-week washout period, the groups switched activities. A pretest, posttest, and retention test 10 weeks later were administered to determine learning and knowledge gained and retained. A 7-point Likert scale questionnaire evaluated the reaction to and impact of the calibration activities. Descriptive statistics analyzed demographic and Likert scale data. Paired samples t-tests were used to analyze the research questions ( $p \leq 0.05$ ).

**Results:** Online calibration activities yielded higher posttest scores than in-person activities ( $p=0.01$ ). Findings related to feelings of confidence revealed a greater percentage of participants agreed that online calibration activities increased their ability to evaluate student performance. Findings related to feelings of preparedness supported equal percentages of participants agreed the online and in-person activities increased their ability to teach dental hygiene instrumentation. There was no significant difference between the two activities' retention test scores ( $p=0.235$ ).

**Conclusions:** Faculty members agreed that both online and in-person activities were an effective use of their time and contributed to greater feelings of confidence and preparedness. However, the online calibration activities seemed to be more effective at increasing calibration on instrumentation. More research is needed to determine additional effective online calibration methods.

**Keywords/MeSH terms:** faculty development, faculty calibration, dental hygienists' education, reliability, multimedia instruction, online instruction

## Introduction

To evaluate competencies and ensure students are prepared to perform all necessary tasks required by entry-level dental hygiene clinicians, clinic administrators must implement strategies for evaluation. One of the most widespread methods to assess clinical performance and competency is through clinical faculty evaluation.<sup>1</sup> However, according to a literature review, the lack of validity and reliability between instructors while assessing clinical competence has been well established.<sup>2</sup>

Calibration is needed to increase interrater reliability, especially in areas of subjectivity.<sup>3</sup> Clinical instructors with unique expertise, backgrounds, and clinical skills work toward the common goal of creating competent clinicians. However, variability in evaluation methods, teaching strategies, verbiage, and clinical skills detract from student learning, attention to patient care, and the motivation for a student to perform to the highest standard.<sup>3-5</sup> Conflicting information from evaluators can cause frustration, confusion, and dissatisfaction among students.<sup>6,7</sup>

Understanding students' and faculty members' perceptions of the barriers they perceive have an impact on learning is necessary to address variances in evaluation. Variability in the interpretation of grading criteria and evaluation increased stress in the clinical learning environment and negatively impacted learning.<sup>8,9</sup> Variations in evaluation led students to change their performance based on which instructor was evaluating them to please that instructor and earn a higher grade.<sup>3,4,10</sup> Additionally, students reported the differences among faculty members were a major concern, and discrepancies in assessment impacted program evaluation.<sup>11</sup>

From a clinical faculty perspective, they would have more positive and effective interactions with students if they received more professional preparation.<sup>12</sup> Novice faculty reported dissatisfaction with their experiences transitioning from clinical practice to education.<sup>13</sup>

Dissatisfaction stemmed from a feeling of unpreparedness and lack of confidence due to insufficient educational resources offered by the institution.<sup>14</sup> These inadequacies highlight the need for sufficient, effective, and convenient training resources for clinical faculty members.

The American Dental Association Commission on Dental Accreditation Standards for Dental Hygiene Education Programs requires dental hygiene program faculty members to show evidence of calibration for clinical evaluation.<sup>15</sup> However, Dicke et al. reported that most calibration occurring in the clinical setting was based on discussion rather than actual skill standardization, which is imperative to demonstrate evidence of calibration for clinical teaching.<sup>4,5,16</sup> One suggested method to close the gap between discussion and clinical skill development is the use of multimedia instruction.<sup>17</sup> Multimedia instruction is defined as the use of visual aids as well as words to foster learning.<sup>18</sup> Videos are one type of visual aid. DiGiacinto reported that adult learners performed better when verbal information was supplemented with visual information.<sup>19</sup>

Little is known about the effects instructional videos could have on dental hygiene clinical faculty knowledge and effectiveness, confidence, and feeling of preparedness in academia. An instructional technique video was used for faculty calibration in a 2017 pilot study to explore the effectiveness of head and neck exam standardization.<sup>20</sup> The use of an instructional video increased the knowledge level of dental hygiene clinical faculty for head and neck examinations. In another study, the experiences of novice dental hygiene faculty when transitioning from private practice into clinical teaching roles were studied. Although orientation sessions and calibration meetings were offered to novice dental hygiene faculty transitioning from clinical practice into clinical teaching, participants reported that visual aids, such as

instructional videos and hands-on demonstrations would have helped them prepare for new teaching roles.<sup>21</sup>

Electronic video instructional training has also been shown to be beneficial amid the COVID-19 pandemic. Technological interventions such as virtual meetings with colleagues were introduced.<sup>22</sup> The use of technology for instruction is currently gaining momentum, and its practicality and cost-effective nature have demonstrated importance during the pandemic era. Since educators have been inescapably pushed to rely on technology-based instruction it can be developed and evaluated for application in education post-COVID.<sup>23</sup>

Based on the literature reviewed, research questions were developed to gain answers to questions regarding calibration effectiveness for dental hygiene clinical faculty members.

1. Is there a significant difference in the pretest, post-test, and retention instrumentation evaluation scores between the online calibration and in-person calibration groups?
2. How does the reaction (effectiveness and feelings of confidence and preparedness) compare between the online calibration and in-person calibration groups?
3. How does the impact of the calibration compare between the online calibration and in person calibration groups?

This study was conducted in response to limited research in the area of dental hygiene faculty calibration using actual skill standardization and the need for convenient and effective calibration. The intent was to evaluate the effectiveness of online instructional videos on clinical faculty evaluation of instrumentation.

## Materials and Methods

This study received expedited ethical approval from Idaho State University's Institutional Review Board (IRB-FY2022-255). The research design implemented was a randomly assigned crossover design. The sample of convenience consisted of part-time and full-time clinical faculty assigned to first- and second-year clinical education during the fall 2022 semester.

To evaluate the calibration sessions and collect data on the effectiveness of these sessions, the Kirkpatrick Model for Evaluation provided the framework for this investigation.<sup>24</sup> The model consists of four levels of evaluation (Reaction, Learning, Behavior, and Impact). Table 1 reports the definitions of each level and the evaluation mechanism used in this study to collect data.

Level one of the Kirkpatrick Model of Evaluation, Reaction, was evaluated using a questionnaire developed by the primary investigator. Evidence of content validity for the Reaction questionnaire was established by the content validity index (CVI). Content validity forms were provided online to clinical faculty with expertise in clinical teaching. The experts rated each domain on its degree of relevance (1-4, not relevant to highly relevant). After content validation, each expert's relevance rating was recoded as 1 (relevance scale of 3 or 4) or 0 (relevance scale of 1 or 2).<sup>25</sup> Next, the number of experts in agreement the question was relevant was divided by the number of experts. This computation provided the item CVI (I-CVI) or the proportion of content experts giving the item a relevance rating of 3 or 4. Items with an I-CVI of 0.78 or higher for three or more experts were considered evidence of good content validity.<sup>26</sup> All items on the questionnaire received an I-CVI of 0.78 or higher. The Reaction questionnaire was administered directly after the online and in-person calibration activities.

Level two, Learning, determined the degree to which participants acquired the knowledge and skills intended from the calibration sessions and was evaluated using pretest and posttest

evaluation scores for instrumentation technique evaluation. This measurement occurred directly after the online and in-person calibration activities. Data were analyzed using a paired samples t-test and Jamovi software. Prerecorded simulation videos for mock testing were created for both pretests and posttests. All simulation videos ranged from 3-4 minutes. The simulated video for the online calibration pretest for the 11/12 Explorer was created in the maxillary right quadrant. Similarly, the post-test simulation video for the online calibration post-test was created in the maxillary left quadrant. Errors in technique were fashioned similarly for both the pretest and the posttest. The simulated video for the in-person calibration pretest for the Gracey 1/2 curette was created in the mandibular left quadrant. Similarly, the post-test simulation video for the in-person calibration posttest was created in the mandibular right quadrant.

For the purpose of this study, the gold standard for measuring performance consisted of the evaluation of the 11/12 Explorer and Gracey 1/2 Curette as determined by the principal investigator and a co-investigator. The two investigators standardized on the evaluation of both instruments during the compilation of the instructional videos and the gold-standard keys for the instrumentation technique scoring. The gold standard served as the pretest and posttest evaluation key to determine the percentage of correct responses faculty achieved. Pre-existing grading rubrics for evaluation of instrumentation performance using the Anterior Gracey 1/2 Curette and the 11/12 Explorer were used for the pretest and posttest. The instrumentation grading rubrics were developed by the dental hygiene faculty in 2015, prior to an accreditation site visit in 2017, and have been validated over time.

Moreover, level three, Behavior, or the degree to which participants applied what they learned during the semester in the clinical setting, was evaluated using a Retention instrumentation technique evaluation for both instruments and was administered 10 weeks after

completion of all calibration activities. Data were analyzed using paired samples t-tests and jamovi software. The simulated instrumentation videos created for the posttests for both the 11/12 Explorer and the Gracey 1/2 Curette were used for the Retention test. The gold standard for retention test assessment consisted of an evaluation of the 11/12 Explorer and Gracey 1/2 Curette as determined by the principal investigator and a co-investigator. The same preexisting grading rubrics used for the pretests and post-tests were used for the Retention tests.

Lastly, Impact representing level four, determined the degree to which desired outcomes occurred in the clinical setting as a result of the calibration, was evaluated by administering a questionnaire developed by the primary investigator. Evidence of content validity for the Impact questionnaire was also established by the content validity index (CVI) as previously discussed. The Impact questionnaire was administered 10 weeks after all calibration activities for both online and in-person groups.

The study was conducted at Idaho State University August-December of 2022. The sample of convenience consisted of fifteen clinical faculty members who were randomly assigned to one of the crossover sequences. In the fall semester of 2022, clinical faculty members in the dental hygiene department were emailed an invitation to participate in the calibration study. The email contained a cover letter informing the respondents of the study's purpose, risks, benefits, and voluntary nature of the study. If the respondent consented to participate in the study, the informed consent was returned to the principal investigator signed and with a chosen pseudonym to maintain confidentiality.

A two-group randomized crossover AB/BA design (see Figure 1) was used to determine the effect of incorporating online instructional videos into faculty calibration exercises. Participants were randomly assigned to an AB or BA sequence. The group assigned to AB

participated in a pretest (evaluation of prerecorded instrumentation technique) and then received access to the online instructional videos for the calibration session which included reviewing the 11/12 Explorer instrumentation criteria and viewing correct and improper techniques. A posttest was then administered (Learning). After a 2-week washout period, and in phase II, Group AB participated in a pretest (evaluation of prerecorded video instrumentation) and then received the in-person Anterior Gracey 1/2 Curette calibration session reviewing the instrumentation criteria, breaking into dyads to model correct and improper technique, and participating in a question and answer discussion. A posttest was then administered (Learning). Likewise, the participants assigned to BA received the in-person Anterior Gracey 1/2 activity with pretests and posttests (Learning) in the first phase and after a 2-week washout period, and in phase II, they received the online 11/12 Explorer instructional videos for the calibration session with pretests and posttests (Learning). The Reaction to instructional video use and in-person calibration activities was assessed using a Likert scale questionnaire after each calibration activity. The 7-point Likert Scale used ranged from 1=completely disagree to 7=completely agree.

Although there is a discrepancy in the literature about how much time should pass before recalibration, studies have reported that to maintain intra and interrater reliability, experts recommend follow-up calibration exercises be offered anywhere from 10 weeks to 1 year after the initial training.<sup>27</sup> Participants were allowed unlimited access to the instructional videos after phase II was completed. Ten weeks after phase II of the study, all participants participated in two Retention (behavior) tests (evaluation of prerecorded instrumentation technique) to test retention of knowledge of both the online calibrated instrument (11/12 Explorer) and the in-person calibrated instrument (Anterior Gracey 1/2) and were provided Likert scale questionnaires (Impact) to evaluate the degree to which desired outcomes occurred as a result of both the online

and in-person activities. The same Likert Scale used for the evaluation of reaction was used to evaluate impact.

## Results

Twelve of fifteen participants (80%) responded with demographic information. Of the twelve, 8% (n=1) were male and 92% (n=11) were female. The highest degree earned was a master's degree, held by 50% (n=6), and the remaining 50% (n=6) held bachelor's degrees. Sixty-seven percent (n=8) of the respondents had full-time teaching experience. Most (92%, n=11) had taught in preclinic and in junior (first year) or senior (second year) clinics. Additionally, 92% (n=11) had full-time clinical experience ranging from zero years to forty years and 100% (n=12) had part-time experience ranging from one year to forty years.

A statistically significant difference in post-test scores between the online and in-person calibration activities was noted using a paired samples t-test (online=50.1, in-person=40.6;  $p=0.01$ ; 95% CI=2.70, 17.8). This finding suggests greater knowledge and learning were gained with the online video calibration.

There were fifteen responses (100%) to the online Reaction questionnaire and eleven responses (73%) to the in-person Reaction questionnaire. More participants (67%, n=10) mostly or completely agreed the online calibration activities increased their feelings of confidence in the ability to evaluate student performance compared with in-person participants (27%, n=3). Sixty percent (n=9) of respondents indicated they mostly or completely agreed the online calibration left them feeling confident in their ability to verbalize instrumentation feedback for students versus 55% who mostly or completely agreed the in-person calibration increased their feelings of confidence in verbalizing feedback. Just over half of the online participants (53%, n=8) and the in-person participants (55%, n=6) felt the activities increased feelings of confidence in the ability to identify student strengths and weaknesses. Seventy-three percent of respondents mostly or

completely agreed both the in-person calibration (n=8) and the online calibration (n=11) activities increased feelings of preparedness to teach dental hygiene instrumentation. See Figure 2.

When asked if the calibration sessions were an effective use of their time, a majority of online (93%, n=14) and in-person (90%, n=10) participants agreed that the activities were an effective use of their time. A vast majority (80%, n=12) agreed that online instruction provided sufficient instruction to facilitate the evaluation of student performance, whereas, 73% (n=8) agreed that the in-person calibration instruction provided sufficient instruction. Seventy-five percent (n=6/8) of participants agreed the online instruction provided sufficient resources to guide their evaluation and 75% (n=3/4) of participants agreed the in-person instruction provided sufficient resources. However, this question as was inadvertently omitted from the questionnaire for phase II of the study. Nearly all of the online (93%, n=14) and the in-person (91%, n=10) participants were satisfied with the calibration training styles. Table 2 conveys the comprehensive results of survey items that investigated reactions to both activities.

There was no statistically significant difference in retention (Behavior) test scores ten weeks after the calibration efforts between the online calibrated instrument (11/12 Explorer) and the in-person calibrated instrument (Gracey 1/2 Curette) as noted by a paired samples t-test (online=53.3, in-person=49.3;  $p=0.235$ ; 95% CI= -2.86, 10.7). Additionally, there was no significant difference between pretest scores and retention test scores ten weeks after the activities for the online activities (online pre=49.2, online retention=53.3;  $p=0.385$ ; 95% CI= -13.8, 5.65) nor the in-person activities (in-person pre=50.2, in-person retention=49.3;  $p=0.783$ ; 95% CI= -5.75, 7.48).

There were eleven responses to the in-person Impact questionnaire (73% response rate) and thirteen responses to the online impact questionnaire (87% response rate). An overwhelming 85% (n=11) of participants agreed they used what they learned in the online calibration activities and 91% (n=10) agreed they used what was learned in the in-person calibration activities to accurately evaluate student performance. A greater percentage (61%; n=8) agreed they were experiencing more positive interactions with students as a result of the online activities than the in-person activities (54%; n=6).

## **Discussion**

Technology is being embraced more and more by each generation. In response to the suggestion of a previous study to investigate effective calibration methods,<sup>4</sup> this study investigated the effect of online instructional video technology on faculty calibration as an effective means of increasing faculty members' evaluation of instrumentation scores and feelings of preparedness and confidence. As suggested by McMillan, multi-media instruction for clinical faculty calibration should cement the traditional calibration of checklists and rubrics with problem-solving techniques and enhance the intellectual processes involved in how adult learners retain information.<sup>17</sup> The calibration activities in this study supported McMillan's suggestion and incorporated the use of online video instruction to enhance the traditional calibration process. Additionally, the online calibration activity assisted clinical faculty members in recognizing relevant information, picturing a mental image, and integrating the new skills and knowledge with prior knowledge. These strategies are consistent with previous research on adult learning.<sup>29,30</sup> By creating and using an evaluation based on concrete skill standardization and increased feelings of confidence and preparedness, adult learning can be evaluated.

The first two levels of the Kirkpatrick Model of Evaluation, Reaction and Learning, offered data related to the quality and effectiveness of the online calibration program and the

degree to which knowledge and skill were learned.<sup>24</sup> Most educational programs are only evaluated at these two levels to provide feedback and determine the quality of the educational program.<sup>24</sup>

Levels three and four, Results and Impact, offered the data needed to assess the application of information learned and the achievement of increased evaluation scores and feelings of confidence and preparedness to teach clinically. These levels measured clinical evaluation performance and subsequent results related to the reinforcement of calibration. The Behavior and Impact levels are not routinely included as part of the evaluation process, but provide valuable data regarding the effectiveness of implementation of what was learned during the educational program. When planning the evaluation of an educational program, Kirkpatrick suggested thinking of level 4, Impact first, by identifying the desired learning outcomes then determining what participants need to demonstrate to produce effective results. For the purpose of this study, the desired learning outcomes were increased learning (test scores) and increased feelings of confidence and preparedness. The Kirkpatrick model continues to be useful, appropriate, and applicable in the evaluation of training activities.<sup>31</sup> This evaluation model has recently been used to assess both student and faculty educational programs in dentistry.<sup>32-34</sup>

The overall results of the online calibration exercises were positive. Mean instrument evaluation scores *increased* by 10% between pretests and posttests of both online and in-person calibration activities, suggesting an increase in faculty knowledge and learning. The increase in performance outcomes is consistent with previous research which suggested that adult learners recall more information when videos are accompanied by narration versus with text only, where learners can produce more problem-solving solutions.<sup>19</sup> Additionally, Carter had similar findings as the use of instructional video increased the knowledge level of dental hygiene clinical faculty

for head and neck examinations.<sup>20</sup> Consistent with the findings of Bilal et al.'s systematic review and meta-analysis, faculty development and calibration helped improve the self-confidence of clinical faculty.<sup>35</sup> The online participants in this study reported feeling more confident in thoroughly evaluating student performance, verbalizing feedback, and identifying student strengths and weaknesses.

Additionally, an increase in the number of part-time clinical faculty members, diverse responsibilities outside of academia, and most recently, the guidelines for social distancing amid a pandemic, have shown a need for a more flexible approach to faculty calibration. Previous literature reported difficulty getting all faculty together for participation, and program administrators reported finding time for clinical calibration sessions as one of their biggest challenges.<sup>4</sup> A 2019 systematic review and meta-analysis reported current calibration programs required resources, funds, effort, space, commitment, and flexibility, but such a program was not available.<sup>35</sup> The online calibration activity in this study was accessible and convenient to access at any time and from anywhere and had 100% participation from clinical faculty. The online program required very few resources and no space.

In contrast, the in-person calibration activities showed mixed results. Mean instrument evaluation scores *decreased* by 10% between pretests and posttests, suggesting a disconnect between the information gained and the implementation of the knowledge. DiGiacinto reported adult learners given text-only learning instruction may not recall information as well as when provided narration accompanied by video instruction.<sup>19</sup> Also, for a calibration program to be effective, it must occur regularly and technical skills must be addressed and maintained.<sup>4</sup> However, program administrators report frustration with finding recurrent time to accommodate all faculty members' attendance and to provide compensation for their time. For instance,

participants in this study were asked to attend the 1.5-hour calibration on a pre-determined day and at a predetermined time and had to adjust their schedules accordingly to attend. However, continuing education credits were provided for online and in-person participants in this study. More online than in-person participants agreed that the calibration activity was an effective use of their time. Respondents of one study were undecided about their satisfaction with calibration because they felt it was not a wise use of time and resources when the activities were mainly dialog and not technical skill evaluation with a comparison between faculty members.<sup>4</sup>

Evidence of technical skill standardization for clinical teaching is required by the Commission on Dental Accreditation 2022 Standards for Dental Hygiene Education Programs.<sup>15</sup> Previous research reported that most calibration occurring in the clinical setting was discussion rather than concrete skill standardization, and could be enhanced by implementing a standard for measuring performance.<sup>4</sup> Dicke et al. suggested all clinical faculty (novice and seasoned) should be held to the same standards to evaluate student performance.<sup>4</sup> When they agree with the same standard, they also agree with one another. In this study, a gold standard was used to which everyone was compared so that a plan for resolving inconsistencies and re-evaluating outcomes to ensure reliability could be established.

McDermid et al. stated that clinical faculty dissatisfaction stemmed from a feeling of unpreparedness and lack of confidence due to insufficient instruction and educational resources offered by the institution.<sup>14</sup> A vast majority of this study's participants reported having sufficient instruction to evaluate student instrumentation performance after the online calibration instruction, as compared to the in-person calibration instruction.

The literature specifies that students and faculty members want better calibration and training efforts for clinical educators to enable the transfer of clinical skills to students.<sup>4,8</sup> First-

year dental hygiene students were asked in the beginning of the semester journal entry to state what they liked the least about preclinic so far. Forty-one percent (n=29) of the responses focused on the inconsistency between instructors. The same group of students was asked in an end-of-the-semester preclinic journal entry if they had noticed less variability between instructors as the semester progressed. Seventy-two percent (n=29) agreed that there was less variability in verbiage and methods for evaluation. Key responses from both journal entries are provided in Table 3. Calibration efforts were felt among the students and valued, even increasing student satisfaction with their pre-clinical experiences, supporting results of a previous study where clinical faculty felt calibration improves student satisfaction with their education.<sup>4</sup> Furthermore, the majority of clinical faculty agreed they felt they were interacting with students more positively after participating in the online calibration, congruent with previous research that disclosed participants felt they would have more positive and effective interactions with more teaching preparation.<sup>12</sup>

Limitations of this study included the small sample size of convenience. The sample of clinical faculty members from a single dental hygiene program limits the generalizability of results. The response rate is often low and respondents may give answers they think are the *desired* answers rather than accurate answers when using a questionnaire in research.<sup>36</sup> Additionally, one of the disadvantages of crossover trials is the effects of one treatment may carry over and affect the response to subsequent treatments, although the impact of the sequence is unknown.<sup>37</sup> The common approach to prevent this problem is to implement a washout (no treatment) period between consecutive treatments which is long enough to allow the effects of a treatment to wear off. To decrease the chance of this carry-over affect, this study used the

suggested two-week washout period to allow the effects one calibration activity to wear off before exposed to the next calibration activity.

Moreover, using a typodont for the prerecorded instrument technique for evaluation presented challenges. Future investigations using brief video clips of instrumentation on one tooth surface, asking simple yes or no questions about basic fundamentals of instrumentation, and using a live patient may negate the subjectivity of evaluation on a typodont. These steps may not only simplify the evaluation process, but allow for statistical analysis of inter-rater reliability using the Cohen's Kappa analysis.

Future research should compare various online methods for dental hygiene faculty calibration and should focus on actual skills standardization. Evaluation of a program is an essential element of curriculum development, and consideration should be given to what outcomes need measuring and how they will be calculated. The Kirkpatrick Model for Evaluation of training programs has been widely accepted and utilized in the evaluation of both student and faculty dental programs.<sup>32-34</sup>

## **Conclusion**

This study supports past research indicating faculty members find calibration exercises a rewarding and effective use of time. While a greater percentage of the participants agreed the online calibration activities increased their feelings of confidence in the ability to evaluate student performance, online and in-person participants were in equal agreement that the calibration activities increased feelings of preparedness to teach dental hygiene instrumentation. Greater knowledge and learning were gained with the online calibration in this study when comparing pretests and posttests. Instructional video calibration is a promising tool for convenient and effective calibration for both novice and seasoned clinical faculty. Online calibration activities are perpetually available, easily accessed, can be accessed at any time and

from anywhere, and can be repeated as needed. Additionally, assessing true calibration (comparison of the evaluation of performance) reveals strengths and shortfalls in evaluation and can then be addressed. Determining additional effective online calibration methods should be a focus of further research.

**Acknowledgements**

The authors thank Melinda Siler, Administrative Assistant, for her assistance in creating the Qualtrics surveys and the clinical faculty for their participation and contributions.

### References

1. Tucker K. The lived experience of clinical nurse experts transitioning to the role of novice educators. Ph.D. University of Northern Colorado. At:  
<https://www.proquest.com/docview/1882665881/abstract/785C9395295849FDPQ/1>. Accessed May 17, 2022.
2. La Chimea T, Kanji Z, Schmitz S. Assessment of clinical competence in competency-based education. *Can J Dent Hyg.* 2020;54(2):83-91.
3. Brame JL, Gibbings E, Kowlowitz V, McKenna NM, Weintraub JA. Collaborative educational experiences of dental hygiene and audiology students. *J Dent Hyg.* 2019;93(2):7.
4. Dicke NL, Hodges KO, Rogo EJ, Hewett BJ. A survey of clinical faculty calibration in dental hygiene programs. *J Dent Hyg.* 2015;89(4):264-273.
5. Garland KV, Newell KJ. Dental hygiene faculty calibration in the evaluation of calculus detection. *J Dent Educ.* 2009;73(3):383-389.
6. Jacks ME, Blue C, Murphy D. Short- and long-term effects of training on dental hygiene faculty members' capacity to write soap notes. *J Dent Educ.* 2008;72(6):719-724.
7. Kang I, Foster Page LA, Anderson VR, Thomson WM, Broadbent JM. Changes in students' perceptions of their dental education environment. *Eur J Dent Educ.* 2015;19(2):122-130.
8. Belinski DE, Kanji Z. Intersections between clinical dental hygiene education and perceived practice barriers. *Can J Dent Hyg.* 2018;52(2):132-139.
9. Ebbeling S, Adam L, Meldrum A, Rich A, McLean A, Aitken W. Oral health and dental students' perceptions of their clinical learning environment: A focus group study. *J Dent Educ.* 2018;82(10):1036-1042.

10. Deeb JG, Koertge TE, Laskin DM, Carrico CK. Are there differences in technical assessment grades between adjunct and full-time dental faculty? A pilot study. *J Dent Educ.* 2019;83(4):451-456.
11. Henzi D, Davis E, Jasinevicius R, Hendricson W. In the students' own words: What are the strengths and weaknesses of the dental school curriculum? *J Dent Educ.* 2007;71(5):632-645.
12. Paulis MR. Comparison of dental hygiene clinical instructor and student opinions of professional preparation for clinical instruction. *J Dent Hyg.* 2011;85(4):297-305.
13. Forbes MO, Hickey MT, White J. Adjunct faculty development: reported needs and innovative solutions. *J Prof Nurs.* 2010;26(2):116-124.
14. McDermid F, Peters K, John Daly J, Jackson D. 'I thought I was just going to teach': Stories of new nurse academics on transitioning from sessional teaching to continuing academic positions. *Contemp Nurse.* 2013;45(1):46-55.
15. American Dental Association; Commission on Dental Education (2022). Accreditation standards for dental hygiene education programs. At: [https://coda.ada.org/-/media/project/ada-organization/ada/coda/files/dental\\_hygiene\\_standards.pdf?rev=aa609ad18b504e9f9cc63f0b3715a5fd&hash=67CB76127017AD98CF8D62088168EA58](https://coda.ada.org/-/media/project/ada-organization/ada/coda/files/dental_hygiene_standards.pdf?rev=aa609ad18b504e9f9cc63f0b3715a5fd&hash=67CB76127017AD98CF8D62088168EA58). Accessed May18, 2022.
16. Haj-Ali R, Feil P. Rater reliability: short- and long-term effects of calibration training. *J Dent Educ.* 2006;70(4):428-433.
17. Issa N, Mayer RE, Schuller M, Wang E, Shapiro MB, DaRosa DA. Teaching for understanding in medical classrooms using multimedia design principles. *Med Educ.* 2013;47(4):388-396.
18. Mayer R e. Using multimedia for e-learning. *J Comput Assist Learn.* 2017;33(5):403-423.

19. DiGiacinto D. Using multimedia effectively in the teaching–learning process. *J. Allied Health*. 2007;36(3):176-179.
20. Carter BB. Faculty calibration with instructional videos for head and neck examinations. M.S. The University of North Carolina at Chapel Hill; 2017. At: <http://www.proquest.com/pqdtglobal/docview/1952165365/abstract/2B28D469E35E4CB3PQ/1>. Accessed May 23, 2022.
21. Smethers RD, Smallidge DL, Giblin-Scanlon LJ, Perry KR. Experiences and challenges of clinical dental hygienists transitioning into teaching roles. *J Dent Hyg*. 2018;92(6):40-46.
22. Shah S. The technological impact of COVID-19 on the future of education and health care delivery. *Pain Phys*. 2020;4S;23(8;4S): S367-S380.
23. Sahi PK, Mishra D, Singh T. Medical education amid the COVID-19 pandemic. *Indian Pediatr*. 2020;57(7):652-657.
24. Kirkpatrick Partners. (2023). The Kirkpatrick model. At: <https://kirkpatrickpartners.com/the-kirkpatrick-model/>. Accessed: February 3, 2023.
25. Yusoff MSB. ABC of content validation and content validity index calculation. *EIMJ*. 2019;11(2):49-54.
26. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health*. 2007;30(4):459-467.
27. McAndrew M. Faculty calibration: Much ado about something. *J Dent Educ*. 2016;80(11):1271-1272.
28. McMillan JL. Participation in an Online Faculty Development Program to Support Novice Nursing Faculty. Ph.D. Northern Arizona University; 2020. At:

<http://www.proquest.com/pqdtglobal/docview/2412268816/abstract/D5C5051CA404478FPQ/1>.

Accessed: May 11, 2022.

29. Goddu K. Meeting the challenge: Teaching strategies for adult learners. *Kappa Delta Pi Record*. 2012;48(4):169-173.

30. Sanger PA, Pavlova IV. Applying andragogy to promote active learning in adult education in Russia. *Int J Eng Ped*. 2016;6(4):41.

31. Alsalamah A, Callinan C. The Kirkpatrick model for training evaluation: bibliometric analysis after 60 years (1959–2020). *Ind. Commer. Train*. 2022;54(1):36-63.

32. Badran AS, Keraa K, Farghaly MM. Applying the Kirkpatrick model to evaluate dental students' experience of learning about antibiotics use and resistance. *Eur J Dent Educ*. 2022;26(4):756-766.

33. Gianoni-Capenakas S, Lagraverre M, Pacheco-Pereira C, Yacyshyn J. Effectiveness and perceptions of flipped learning model in dental education: a systematic review. *J Dent Educ*. 2019;83(8):935-945.

34. Johnston C, Ganas J, Jeong YN, Nevius A, Bassir SH, Dragan IF. Faculty development initiatives in academic dentistry: a systematic review. *J Dent Educ*. 2019;83(9):1107-1117.

35. Bilal, Guraya SY, Chen S. The impact and effectiveness of faculty development program in fostering the faculty's knowledge, skills, and professional competence: A systematic review and meta-analysis. *Saudi J. Biol. Sci*. 2019;26(4):688-697.

36. Patten ML. *Questionnaire Research: A Practical Guide*. 3rd ed. Pyrczak Pub.; 2011.

37. Sibbald B, Roberts C. Understanding controlled trials crossover trials. *BMJ*. 1998;316(7146):1719-1720.

## Tables

**Table 1 Kirkpatrick Model Levels Defined**

<b>Kirkpatrick Model Levels</b>	<b>Definition</b>	<b>Evaluation Mechanism</b>
1. Reaction	The degree to which participants found the calibration activities were effective, built confidence, and prepared them for their clinical faculty roles.	The Reaction questionnaire was administered directly after the online instructional video calibration and the in-person calibration activity.
2. Learning	The degree to which participants acquired the knowledge and skills intended from the calibration sessions.	The Posttest Instrument Technique Evaluation was administered directly after the online instructional video calibration and the in-person calibration activity.
3. Behavior	The degree to which participants applied what they learned during the semester in the clinical setting.	The Retention Instrumentation Technique Evaluation administered 10 weeks after completion of all calibration activities.
4. Impact	The degree to which desired outcomes occurred in the clinical setting as a result of the calibration.	The Impact questionnaire was administered 10 weeks after completion of all calibration activities.

(Kirkpatrick Partners, 2022)

**Table 2 Reaction Results**

<b>Reaction Results</b>		<b>1=Completely Disagree</b>	<b>2=Mostly Disagree</b>	<b>3=Somewhat Disagree</b>	<b>4=Neither Agree or Disagree</b>	<b>5=Somewhat Agree</b>	<b>6=Mostly Agree</b>	<b>7=Completely Agree</b>
<b>Online n=15</b>								
<b>In person n=11</b>								
Overall, I was satisfied with the training provided	online	0% n=0	7% n=1	0% n=0	0% n=0	20% n=3	47% n=7	27% n=4
	in person	0% n=0	0% n=0	9% n=1	0% n=0	45% n=5	27% n=3	18% n=2
The calibration session was an effective use of my time	online	0% n=0	7% n=1	0% n=0	0% n=0	33% n=5	27% n=4	33% n=5
	in person	0% n=0	0% n=0	0% n=0	9% n=1	18% n=2	36% n=4	36% n=4
The course covered essential material	online	0% n=0	7% n=1	7% n=1	0% n=0	7% n=1	27% n=4	53% n=8
	in person	0%	0%	9%	0%	9%	45%	36%

Reaction Results		1=Completely Disagree	2=Mostly Disagree	3=Somewhat Disagree	4=Neither Agree or Disagree	5=Somewhat Agree	6=Mostly Agree	7=Completely Agree
Online n=15								
In person n=11								
		n=0	n=0	n=1	n=0	n=1	n=5	n=4
I was satisfied with the training style	online	0%	0%	7%	0%	20%	53%	20%
		n=0	n=0	n=1	n=0	n=3	n=8	n=3
	in person	0%	0%	9%	0%	18%	73%	0%
		n=0	n=0	n=1	n=0	n=2	n=8	n=0
I feel more confident in my abilities to thoroughly and accurately evaluate student performance	online	0%	0%	7%	13%	13%	33%	33%
		n=0	n=0	n=1	n=2	n=2	n=5	n=5
	in person	0%	0%	22%	0%	55%	18%	9%
		n=0	n=0	n=2	n=0	n=6	n=2	n=1
	online	0%	0%	7%	13%	20%	27%	33%

<b>Reaction Results</b>		<b>1=Complet</b>	<b>2=Mostly</b>	<b>3=Somewhat</b>	<b>4=Neither</b>	<b>5=Somewhat</b>	<b>6=Mostly</b>	<b>7=Completely</b>
<b>Online n=15</b>		<b>ely</b>	<b>Disagree</b>	<b>Disagree</b>	<b>Agree or</b>	<b>Agree</b>	<b>Agree</b>	<b>Agree</b>
<b>In person n=11</b>		<b>Disagree</b>			<b>Disagree</b>			
I feel more		n=0	n=0	n=1	n=2	n=3	n=4	n=5
confident in my	in person	0%	9%	0%	9%	27%	36%	18%
abilities to		n=0	n=1	n=0	n=1	n=3	n=4	n=2
verbalize								
instrumentation								
feedback for								
students								
I feel more	online	0%	0%	7%	13%	27%	40%	13%
confident in my		n=0	n=0	n=1	n=2	n=4	n=6	n=2
abilities to	in person	0%	0%	9%	18%	18%	45%	9%
identify student		n=0	n=0	n=1	n=2	n=2	n=5	n=1
strengths and								
weaknesses								

Reaction Results		1=Complet	2=Mostly	3=Somewhat	4=Neither	5=Somewhat	6=Mostly	7=Completely
Online n=15		ely	Disagree	Disagree	Agree or	Agree	Agree	Agree
In person n=11		Disagree			Disagree			
I feel more confident in my abilities to use the evaluation rubric	online	0% n=0	0% n=0	7% n=1	14% n=2	21% n=3	14% n=2	43% n=6
One online participant did not answer this question <b>online n=14</b>	in person	0% n=0	18% n=2	9% n=1	9% n=1	36% n=4	27% n=3	0% n=0
I feel assured that I will be able to	online	0% n=0	0% n=0	0% n=0	13% n=2	27% n=4	27% n=4	33% n=5

<b>Reaction Results</b>		<b>1=Completely Disagree</b>	<b>2=Mostly Disagree</b>	<b>3=Somewhat Disagree</b>	<b>4=Neither Agree or Disagree</b>	<b>5=Somewhat Agree</b>	<b>6=Mostly Agree</b>	<b>7=Completely Agree</b>
<b>Online n=15</b>								
<b>In person n=11</b>								
help students feel confident and able	in person	0% n=0	0% n=0	9% n=1	9% n=1	18% n=2	45% n=5	18% n=2
There are still concepts of student evaluation that I do not understand	online	0% n=0	33% n=5	20% n=3	20% n=3	13% n=2	0% n=0	13% n=2
	in person	9% n=1	9% n=1	9% n=1	18% n=2	18% n=2	27% n=3	9% n=1
The calibration session fostered a supportive learning	online	0% n=0	0% n=0	0% n=0	27% n=4	27% n=4	20% n=3	27% n=4
	in person	0% n=0	0% n=0	0% n=0	0% n=0	18% n=2	18% n=2	64% n=7

<b>Reaction Results</b>		<b>1=Complet</b>	<b>2=Mostly</b>	<b>3=Somewhat</b>	<b>4=Neither</b>	<b>5=Somewhat</b>	<b>6=Mostly</b>	<b>7=Completely</b>
<b>Online n=15</b>		<b>ely</b>	<b>Disagree</b>	<b>Disagree</b>	<b>Agree or</b>	<b>Agree</b>	<b>Agree</b>	<b>Agree</b>
<b>In person n=11</b>		<b>Disagree</b>			<b>Disagree</b>			
environment where I felt comfortable and heard								
I feel like I have sufficient resources to guide me in evaluation of student performance Question not included in phase	online	0% n=0	0% n=0	13% n=1	13% n=1	38% n=3	13% n=1	25% n=2
	in person	0% n=0	0% n=0	0% n=0	25% n=1	25% n=1	25% n=1	25% n=1

<b>Reaction Results</b>		<b>1=Complet</b>	<b>2=Mostly</b>	<b>3=Somewhat</b>	<b>4=Neither</b>	<b>5=Somewhat</b>	<b>6=Mostly</b>	<b>7=Completely</b>
<b>Online n=15</b>		<b>ely</b>	<b>Disagree</b>	<b>Disagree</b>	<b>Agree or</b>	<b>Agree</b>	<b>Agree</b>	<b>Agree</b>
<b>In person n=11</b>		<b>Disagree</b>			<b>Disagree</b>			
2 questionnaire								
<b>online n=8</b>								
<b>in person n=4</b>								
I feel like I have had sufficient instruction to evaluate student instrumentation performance	online	0% n=0	0% n=0	13% n=2	7% n=1	27% n=4	40% n=6	13% n=2
	in person	0% n=0	0% n=0	27% n=3	0% n=0	18% n=2	45% n=5	9% n=1
I feel prepared for clinical teaching of	online	0% n=0	0% n=0	7% n=1	13% n=2	7% n=1	47% n=7	27% n=4
	in person	0% n=0	0% n=0	9% n=1	0% n=0	18% n=2	27% n=3	45% n=5

<b>Reaction Results</b>		<b>1=Complet</b>	<b>2=Mostly</b>	<b>3=Somewhat</b>	<b>4=Neither</b>	<b>5=Somewhat</b>	<b>6=Mostly</b>	<b>7=Completely</b>
<b>Online n=15</b>		<b>ely</b>	<b>Disagree</b>	<b>Disagree</b>	<b>Agree or</b>	<b>Agree</b>	<b>Agree</b>	<b>Agree</b>
<b>In person n=11</b>		<b>Disagree</b>			<b>Disagree</b>			
dental hygiene								
instrumentation								

**Table 3 Representative Quotes: Student Feelings Toward Faculty Calibration**

<b>Beginning of the semester journaling question: What aspects of preclinic are you enjoying the least?</b>
<p>“I do find that faculty members are telling students different ways to correctly perform a procedure which can be confusing as learners.”</p> <p>“Each instructor shows us something different or they show ‘their’ way of doing things.”</p> <p>“Many of the instructors had different views when practicing this assessment and so it was very hard for me to understand what to do and what not to do.”</p> <p>“My least favorite part about clinic is when I get all sorts of different information. That’s when things start to get really confusing, and I just want to give up.”</p> <p>“Second, the aspects of clinic that I enjoy least is possibly getting sometimes getting confused with how we are supposed to things because some of the instructors will say one thing and the other will say something else.”</p> <p>“I would also like it if each instructor would be on the same page because it is hard to learn when each instructor does things and or has learned how to demonstrate the task differently.”</p> <p>“It’s hard to know expectations when it can depend on which advisor you have that week.”</p> <p>“In terms of least favorite aspects, it has been difficult gauging how each faculty member grades as it’s not always consistent.”</p> <p>“What I dislike the most about clinic is the inconsistency of information.”</p>

**End of the semester journaling question: Have you noticed less variability in instrumentation evaluation between faculty members over the course of the semester?**

“I have noticed a huge difference between the faculty and the verbiage that they are using. I feel like it is a lot more uniform in the way that they present the skill to us. They use the same words and then go on and explain it differently if they don’t think we quite understood what they were saying.”

“I have noticed less variety with instructors. For the major things, I think most instructors match each other on what they say.”

“I have noticed that there is less variability in verbiage that the instructors use. They are, for the most part, using the same words to describe things.”

“I feel there has been a great improvement in the communication between faculty and students and a complete sense of fairness when being graded.”

“This has made the learning process feel smoother and more cohesive.”

“I did notice less variability between my instructors. I didn’t feel that there were any differences between my instructor’s evaluations. Everyone was on the same page, and I knew exactly what was expected of me.”

“I do notice a less variability in verbiage in instrumentation evaluation and correction between faculty members over the course of the semester. At the beginning of the semester, I felt like there was a lot of opinions and different methods from every instructor, which sometimes I would get confused.”

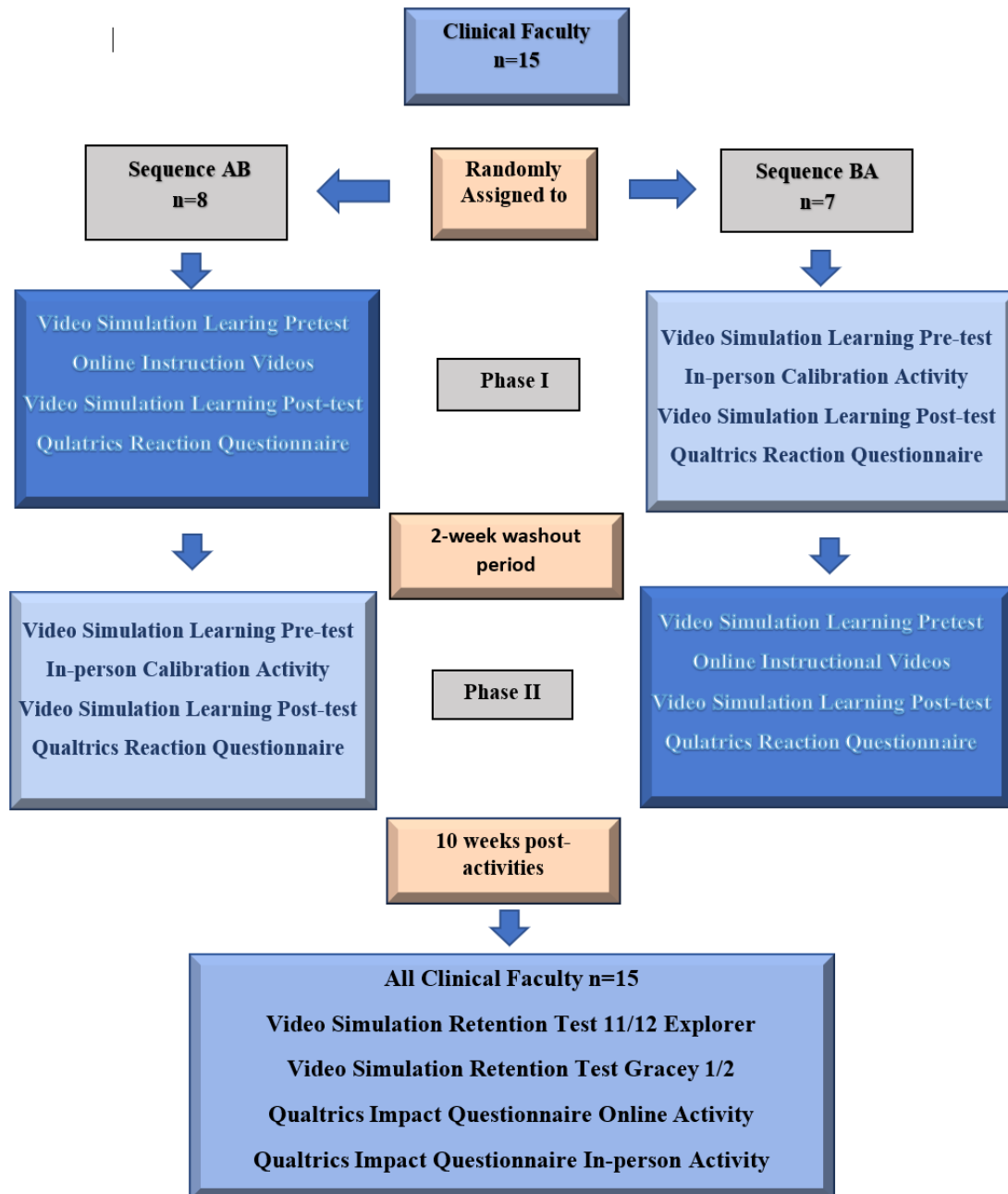
“Although there are discrepancies, I can see that the instructors are working hard to create a more cohesive environment in regard to learning”

“I think in my experience I have not seen as many variations in expectations and instructions on how to properly use instruments.”

“I have noticed less variability in verbiage in instrumentation evaluation between faculty members and I have also noticed different corrections on our evaluations between them.”

## Figures

**Figure 1 Two-group Randomized cross-over AB/BA design**



**Figure 2 Comparison of Reaction Results: Feelings of Confidence and Preparedness**