Spring 2017

The Effects of a Digital Platform on Achievement in Dental Assisting Classrooms

Maia Hopkins Carpenetti
California State University, Monterey Bay

The Effects of a Digital Platform on Achievement in Dental Assisting Classrooms

Maia Hopkins Carpenetti

Thesis Submitted in Partial Fulfillment of the Requirements for the
Degree of Master of Arts in Education

California State University, Monterey Bay

May 2017

The Effects of a Digital Platform and Achievement in Dental Assisting Classrooms

Maia Hopkins Carpenetti

APPROVED BY THE GRADUATE ADVISORY COMMITTEE

Kerrie Chitwood, Ph.D.
Advisor and Program Coordinator, Master of Arts in Education

Casey McPherson, Ph.D.
Advisor, Master of Arts in Education

Erin Ramirez, Ph.D.
Advisor, Master of Arts in Education

Kris Roney

Digitally signed by Kris Roney
Date: 2017.05.26 11:11:18 -08'00'

Kris Roney, Ph.D. Associate Vice President
Academic Programs and Dean of Undergraduate & Graduate Studies

Abstract

Digital teaching tools are prevalent in classrooms now more than ever. Using a digital teaching tool (e.g., a blog) can positively affect student engagement and achievement due to its relevancy to students who have become increasingly more exposed to technology. However, the scarce research on technological instructional tools and achievement in a Career and Technical Education (CTE) classroom, particularly dental assisting, is what brought about the need for this research project. The purpose of this study was to determine if a technology intervention using a blog affected dental assisting students' achievement. Participants in this study were dental assisting students, ranging in ages from 18-55, attending a dental assisting program in Central California (n = 24). This study utilized a quantitative pretest/post-test design using a convenience sample. Using independent and paired samples t-tests, pre and post-test assessment data were analyzed. Results only partially supported the original hypothesis that treatment group participants would have higher achievement gains, since the treatment group post-test scores were not statically significantly different than those of the control group. Although data analysis showed that post-test scores between both groups (i.e. treatment and control) were not statistically different, both groups did show substantial improvement between pre and post-tests.

Keywords: blog, dental assistant, CTE, achievement, metacognition, reflective activity

Acknowledgements

I would like to thank my thesis advisors Erin Ramirez, Kerrie Chitwood, and Casey McPherson of CSUMB, who have been incredibly dedicated and available whenever I needed advice and guidance. Their support and wealth of knowledge helped me get through this process so I could be successful.

I would also like to thank my program director Karoline Grasmuck, who consistently offered valuable input and encouragement throughout this process.

I would also like to thank Professor Josh Carr of CSUMB for coming to my aide when I needed to choose a blog intervention. His patience in teaching me how to use my chosen intervention was key in my confidence in using it.

Finally, I would like to thank my mother Lydia, grandmother Janet, and aunt Marcia for supporting my decision to enter this program, offering advice on my writing, and lending an ear when challenges arose while fulfilling this accomplishment.

Table of Contents

The Effects of a Digital Platform on Achievement in Dental Assisting Classrooms

Literature Review

Education has evolved as a function of society and the changing needs of the times (Silver, 2013). Dramatic changes to the educational system have been brought on by political unrest and the need for social action. In particular, the *Free Schools* of the 1960's offered alternatives to the standard public school model (Lange & Sletten, 2002). These alternative models offered educational frameworks both in and out of the public school system. These frameworks ranged from 'schools without walls' which encouraged community-based education, to 'learning centers' and 'magnet schools' which proposed a curriculum designed for multicultural education and which emphasized racial integration (Lange & Sletten, 2002).

Cognition and Learning

Although progress toward an improved educational setting has been slow, there have been advances in how students learn (Kukulska-Hulme, 2012). One major advance has been acknowledging the learner's thought process, also known as cognition, in the classroom. Cognition plays a vital role for both teachers and students (Pressley & Harris, 2008). Educators must clearly explain new and often abstract concepts to students; while at the same time students must develop the schema to categorize and understand what is being taught (Derry, 1996). The schema theory was developed by Jean Piaget (1952), describing how a young learner organizes and stores knowledge. Each component of knowledge gets categorized and stored, then utilized when needed. For example, the actions needed for grocery shopping or pumping gas (McLeod, 2015), or how a student makes a connection with themselves or the world around them while reading a book. As cognitive development increases in complexity, so do the schemata one has

gained (McLeod, 2015). Both schema and cognitive development involve a process of reorganization that advances with age and experience.

The theory behind cognitive development and the constructivist approach to learning focuses on the individual learner. Piaget's theory of cognitive development describes the way humans build their own knowledge (i.e., schemas), while the constructivist approach concentrates on the role of the individual in their learning. As one grows and matures, one attains higher order learning and well-developed critical thinking skills. To illustrate how higher order learning can be achieved, Bloom created Bloom's Taxonomy (Forehand, 2010); a classification of various forms of thinking to explain the learning process.

The 2001 revised Bloom's taxonomy (see Figure 1) begins with *remembering* (previously known as *knowledge*) and ends with *creating.* In the *remember* stage, students are capable of tasks such as listing, defining, repeating and memorizing; similar to what one may do when preparing for and taking a spelling test. Toward the top of the pyramid is *analyzing.* In this stage, a student can compare and contrast, question content, and relate to what is being taught. When a student reaches the analysis stage, he/she is competent in reflecting on the learning that has taken place (Forehand, 2010). The goal of education is to increase achievement. The higher students progress on the Bloom's taxonomy pyramid, the greater the level of learning that can be achieved.

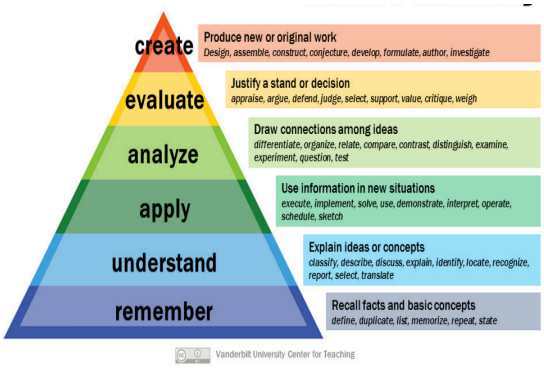

Figure 1. Bloom's Taxonomy (revised version)

As the graphic representation of development displays, experiential learning could play a role in reaching the upper tiers. As Dewey posited nearly eighty years ago, young learners grow up to contribute to their communities by learning through relevant hands-on experiences (as cited by Simon and Schuster, 2007). Though Dewey was considered very progressive for his time, experiential learning is continuously being integrated into school curricula with many secondary and post-secondary educational institutions offering courses and programs that incorporate an in-depth hands-on approach to teaching (Holstermann, Grube, & Bogeholz, 2010; Wonacott, 2002).

The secondary and post-secondary schools offering Career and Technical Education (CTE) programs give students the chance to learn about, experience, and acquire specific occupational skills. In a program called High Schools That Work (HSTW), participating schools across the country found their models of integrating CTE courses and college prep curricula showed outstanding success in achievement gains. The program's progressive nature involved parents, the community, students in their educational goals, and articulation of courses with local community colleges (Wonacott, 2002). By combining exploratory learning with CTE and college preparatory coursework, students saw meaning in their work, which led to increased engagement and achievement (Castellano, Sundell, Overman, & Aliaga, 2012; Jelas, Azman, Zulnaidi, & Ahmad, 2016; Reyes, Brackett, Rivers, White, & Salovey, 2012).

In addition, exploratory learning led to student engagement being positive correlated to achievement (McLaughlin et al., 2013; Mistler-Jackson & Songer, 2000; Quaye & Harper, 2014). In a study by McLaughlin and colleagues (2013), a satellite pharmacy class was flipped to examine the effects on student engagement and achievement. A flipped classroom is an instructional technique that switches the traditional group learning environment to an individual learning space; class time is then spent working interactively and collaboratively (Mok, 2014).

This class offered its lectures online with repeated accessibility (i.e., students could watch the lecture multiple times), and used classroom time for interactive learning. The results of this two year study showed that the flipped classroom enhanced student engagement and achievement. Similarly, in a publication by Quaye and Harper (2014), the discussion of engagement and student outcomes posits that students who feel engaged in their academic endeavors and connected to their learning institution have improved achievement outcomes.

Moreover, in the Mistler-Jackson and Songer (2000) study, sixth grade students were given inquiry-based computer technology assignments, with the hope of improving student motivation and learning opportunities while working on their science projects. Findings of this study indicated that a technology-based assignment improved participant's self-efficacy (i.e., the belief in one's ability to succeed in completing a task; a confidence in one's self-efficacy will take on greater challenges rather than avoid them), which created a sense of empowerment. This sense of empowerment had positive effects on participant's achievement.

Learning with Mobile Technology

Research has shown that for years educators have been making adjustments to their curriculum to incorporate various types of technology and mobile learning to accommodate the ever-present digital world (Ertmer, 2005). In a study by Goldman, Cohen, and Sheahan (2008), graduate level students from various health-related majors participated in a study using a blog as a tool for learning. The results showed that over 60% of participants favored the use of the blogging platform. Alternative tools for educational communication, such as blogs, can encourage student engagement and generate a more collaborative learning environment (Fox & Lenhart, 2006).

Additionally, in a study by Martin and Ertzberger (2013), effects of mobile learning and student achievement were investigated and compared, as well as student attitudes toward learning. This study referred to mobile technology as *here* and *now* learning because it could be accessed anytime, and anywhere. The results of this study showed positive outcomes for both achievement and attitude. In a study about English language acquisition and digital storytelling, Yang and Wu (2012) found their participants using digital storytelling outperformed the control group given a lecture type direct instruction. Although digital learning suggests a digitally focused world, and teachers frequently use digital learning tools as instructional supplements, research on their benefits are limited (Halic, Lee, Paulus, & Spence, 2010).

Many teachers from kindergarten through post-secondary school can be found using some form of mobile learning. Research has shown that increased student engagement and achievement are closely related, and both can improve when a technology-based educational tool is used (Halic et al., 2010; Yang & Wu, 2012). Furthermore, using a technology that is relatable to students can have a positive effect on the students' learning experience and achievement (Gikas & Grant, 2013; Gulek & Demirtas, 2005). Gulek and Demirtas (2005) conducted a study on laptop use as an instructional tool to increase academic achievement for middle school students. Their findings showed students who participated in the study earned significantly higher overall GPAs. Additionally, participants showed improved engagement in learning and an increase in writing skills. In the Gikas and Grant study (2013), teachers from three universities implemented a mobile device as a platform for teaching and learning. The use of mobile devices as a learning tool generated a more personalized learning experience for students. Student participants consistently reported that mobile devices improved their engagement. Students also reported that because they gathered information outside of their classroom environment, they

made better connections with course material. Results of the study showed improved student engagement, student interaction and collaboration.

Improved student achievement is the goal of education. Most students in this digital age are using some form of technology on a daily basis, making technology more familiar and relatable than ever. Using technology as a teaching tool not only helps connect classroom activities and learning to students' interest in technology, but it has also shown to have increased student achievement gains. In a Canadian study by Ciampa (2014) fifth and sixth grade students used a tablet as part of their classroom instruction. Participants showed improved academic achievement, an increase in social skills and engagement, student motivation, and an improved collaborative team-work environment. When integrated thoughtfully, technology tools can be a useful resource to teachers of all grade levels.

Technology and Dental Schools

Technologically-based teaching tools can be found in advanced educational facilities as well. For example, dental schools are making technological advancements in their instruction and curriculum. Many of these schools are well funded, and recognize the need for improvement, support, and technological integration in their curricula (Bertolami, 2007). The Marquette University School of Dentistry (MUSoD) restructured its curriculum in 1999 by integrating a modernized dental educational program that included a focus on community service and evidence-based instructional approaches to dental education. MUSoD also created partnerships with multiple sites in order to offer relevant experiential learning practice local to international locations. The MUSoD paradigm, along with other dental schools with similar programs, has shown a positive influence on student's mastery of skills in the clinical setting (Iacopino, 2007).

Although dental schools have incorporated more technology into the classroom setting, schools that produce dental assistants have produced significantly less research regarding technology use. Therefore, this study will focus specifically on a technology intervention and integration in a dental assisting classroom. Due to the dearth of literature focusing on the dental assisting field and dental assisting student achievement specifically, other health related professions are worth exploring for successful technology-based instructional ideas. For example, some nursing school classrooms are using technology in student training in the form of interactive computerized technology-based mannequins (Cheng, Lang, Starr, Pusic, & Cook, 2014; Medley & Home, 2005). By using these interactive mannequins to simulate live patients, students are more comfortable transitioning to a true live patient setting. Additionally, medical schools use simulation technology to train students in cardiac conditions, laparoscopic surgery, and anesthesia. Though simulation does not fully replicate real-life experiences, this technology has been shown to improve surgical skills, and knowledge retention and in developing the hands-on skills needed to perform such medical duties (Medley & Home, 2005).

Although technological tools can be found in numerous other fields such as nursing, medical training, hospitality, automotive study, and pilot training, the paucity of research that examines these specific achievement strategies in the dental assisting field is extremely limited. Dental assisting depends heavily on students having first-hand experience with the many aspects of the dental office. From greeting and seating a patient to passing dental instruments properly, the dental assisting student must be familiar with the many components of the working dental office (Finkbeiner, 2000). A dental assistant, defined by the American Dental Association (ADA, 2017), is a valuable member of the dental health team who assists the dentist with procedures, and completes the dental assisting duties for which he/she is licensed. Dental assistants work

closely with the dentist, patients, and other dental staff and have a thorough understanding of oral health, excellent multi-tasking skills, exceptional interpersonal skills, and must work efficiently (Bird & Robinson, 2013; Finkbeiner, 2000; Robinson & Mclaughlan, 1996). Dental assistants who possess these skills can accomplish significantly more tasks while remaining on schedule. Although published research on dental assistants is scarce, preferred characteristics are widely known in the dental community.

Technology and efficiency. In an efficiency study done in a hospital setting where technology was involved, steps were taken to improve the emergency department (ED) efficiency by redesigning the ED process. This study resulted in reduced wait times and ambulance diversions, along with multiple other successes due to improved efficiency (Kelly, Bryant, Cox, & Jolley, 2007). Similarly, in a study done by Cima and colleagues (2011) in operating rooms (OR), it was reported that strategies taken to increase OR efficiency led to significant improvement as well as financial gains. When health care professionals can competently and efficiently deliver a high quality of care, patients' needs can be successfully met; ultimately improving patients' overall health, and the health of the community. This evidence demonstrates the value of efficiency in the health field, and is likely the case in the dental setting as well. Although studies examining dental assistants 'efficiency efforts were not found, they should be explored because dental assistants play a crucial role in dental patient satisfaction. A high quality of care and patient satisfaction are the goal of efficiency efforts.

These key concepts of efficiency, competency, interpersonal skills, and multi-tasking, are taught nationwide at CTE facilities with dental assisting programs. Furthermore, CTE programs generally function with the theory that exploratory learning effectively prepares students for their careers (Clark, Threeton, & Ewing, 2010). However, very little research can be found that

discusses specific methods used to improve student achievement in dental assisting programs. This is problematic because improvements in dental assisting instruction and curriculum will be difficult without knowing where improvements need to be made. Critical thinking, problem solving, student engagement and achievement are valuable elements in all classroom settings and for all disciplines (Castellano, 2012; Jelas et al., 2016; Quaye & Harper, 2014; Reyes et al., 2012).

Unfortunately, there is little research done on the specific discipline of dental assisting and how such constructs are encouraged and assessed. A K-12 teacher has access to, and knowledge of multiple proven resources for planning lessons, increasing student engagement, and improving student achievement (Gulek & Demirtas, 2005; Wenglinsky, 1998), so too should the dental assisting instructor. It would be beneficial for dental assisting instructors to be aware of, and have access to, teaching tools that can be incorporated in the dental assisting classroom to improve teaching practices and subsequently student achievement.

Exploratory and Reflective Learning

There is value to be found in simulations and supplemental exploratory learning strategies as teaching tools (Medley & Home, 2005). For example, dental assisting students practice various skills on mannequins multiple times before live patient certification. Dental assistants who get certified for dental x-rays, coronal polish, and sealants exercise their skills on simulated mannequins with a classmate. This level of training allows them to be comfortable with the procedure before they can be certified to work on live patients.

Additionally, students in a dental assisting classroom act as patients for each other when practicing vital signs, executing computerized dental charting, and completing comprehensive oral examinations. Simulations such as these, provide learners with hands-on experience;

allowing them to put knowledge into practice. Having tactile experience of dental assisting skills can give students a sense of confidence when they reach the externship stage of their education, and when they begin their careers (Cheng et al., 2014; Medley & Home, 2005). Given dental assisting's moderately high technology base and the propensity for dental assistants to work closely with the dentists who employ them, it is important that dental assistants have similar experiences with modernized technology and curriculum.

Dental assistants share much of the workload of many dental technologies, and must work closely with their coworkers. In order to deliver a high standard of care, the dentist must rely on the assistant to complete tasks both individually and collaboratively. Understanding dental office computer software, using radiographic technology, and having experienced a comprehensive education in the dental field are important elements in a work environment that requires close working relationships with a strong technology base. Exploratory learning strategies as teaching tools paired with simulations in the dental assisting classroom are favorable teaching techniques for dental education (Evans, Henderson, & Johnson, 2010). Given the daily hands-on element involved in dental healthcare, instructional technology resources are of particular importance.

Recent advancements in dental school curricula include many technology-based instructional resources for dental professors (Issenberg et al., 1999). Unfortunately, dental assisting instructors have far fewer resources they can apply toward progression in their curriculum. In research discussing the issues with globalization and dental education (Donaldson, et al., 2008), the dissonance of dental education and dental practice has created barriers for practitioners. Further, there are a number of incongruences between dental schools and dental assisting schools (Donaldson et al., 2008). Despite these key differences, the desired

end result is the same: produce educated, skilled practitioners who are prepared for their dental career.

Equally important to technology-based instruction of career preparation for the dental assisting field, is creating a learning environment that supports critical thinking (Schindler & Burkholder, 2014). Critical thinking skills can be taught to students using various techniques, including activities involving reflective learning. In a study by Forneris and Peden-McAlpine (2007), novice nurses were given various reflective learning activities, namely journaling, individual interviews, and discussion groups facilitated by a leader, to promote critical thinking skills. In this qualitative study, findings showed that nurses who participated showed positive and discernable changes in their critical thinking skills. Participants learned how to think beyond simply applying contextual knowledge, which limits a nurse in how to differentiate knowledge per patient, to creating new context-based knowledge (Forneris & Peden-McAlpine, 2007).

After reviewing this study, the stages of thought process advancement can be seen in Bloom's taxonomy (Forehand, 2010). With this exercise, participants naturally moved up the pyramid of Bloom's taxonomy (Forehand, 2010). These participants put critical thinking skills to use in order to better serve their patients. Reflective learning activities seen in the Forneris and Peden-McAlpine study would be useful in creating critical thinking skills for dental assistants. By offering more reflective activities in dental assisting curricula, students will have the opportunity to think critically in preparation for their dental careers.

As with the Forneris and Peden-McAlpine (2007) nursing study, reflective learning activities can also be applied to a dental assisting learning environment. For example, offering students the opportunity to journal about the day's lesson content could give students an added study resource. By engaging reflective journaling, students can evaluate their own understanding

of content and lab performance. This evaluation process guides students to analyze their own metacognition (Broadbent & Poon, 2015). Metacognition is essentially thinking about one's own thinking. Students with metacognitive skills can monitor their own thinking rather than waiting for their teacher to do so. Metacognition helps students understand their strengths and weaknesses. Students with metacognitive skills have better thinking strategies and can apply contextual knowledge to tasks and problem solving. For example, students who reflect on their own thinking strategies will be able to problem solve why something worked or did not work. This kind of skill can improve student achievement because understanding one's ability or knowledge boundaries will help one actively recognize ways to improve (Brame, 2014). Understanding one's own thought processes in academia may improve study skills, leading to improved achievement (Brame, 2014).

Increased achievement is the result of skills that can be acquired through reflective learning (Xie, Ke, & Sharma, 2008). Reflective learning is the process by which an individual introspectively examines an experience in order to make meaning and increase perspective depth, therefore expanding one's learning (Mezirow, 1990). For example, a learner who can reflect on a learning process develops metacognitive skills that help the learner improve outcomes (Brame, 2014). The reflective and analytical learner is able to make meaning of their learning experience, and to have a growth mindset (i.e., the ability to learn from one's mistakes, and grow from that experience [Dweck, 2010]). For example, when a student performs a classroom task, and does not perform as well as intended, he/she can use this negative experience to grow and learn from what led to a negative performance task. These learners can then learn from their own metacognition, ultimately reaching the highest tier of Bloom's taxonomy;

creating. With this skill, learners are capable of generating their own work which demonstrates a level of expertise and mastery that may not be found at lower tiers of Bloom's taxonomy.

Introducing a reflective learning component into a curriculum may not only be enriching to students, but can improve critical thinking skills and inquiry-based learning (Halic et al., 2010; White, Shimoda, & Frederiksen, 1999; Xie et al., 2008). Students who receive more inclusive and enriching resources learn more (Atkins, 1993; Hwang et al., 2015). An enriching resource for reflective learning in (or out of) the classroom could be anything from journal writing to blog posting. With a blog post (Byrd, 2017), for example, students are each other's audience in digital discussions. By simply having discussions, students are activating their metacognitive skills and thinking reflectively. As previously mentioned, reflective metacognitive skills can lead to improved critical thinking skills (Brame, 2014; Broadbent & Poon, 2015; Xie et al., 2008). Since technology has become an essential supplement to teaching, integration of instructional techniques could be implemented via technological means. Further, educational programs can be accessed at home on a traditional computer, or on any mobile device. By using a technology intervention that is convenient and familiar to students, teachers can expect higher engagement, and ultimately improved critical thinking skills and higher achievement (Broadbent & Poon, 2015; Wenglinsky, 1998; Xie et al., 2008).

Reflective learning for dental students. Dental assisting instructors want success and increased achievement for their students, yet many of these instructors are not required to have prior teaching experience (Dental Board of California, 2017). This can lead to some dental assisting educators remaining unaware of the teaching techniques and teaching tools that can be applied in their classrooms. Given that part of what occurs in the dental assisting classroom is already reflective in nature, it is a natural next step to begin infusing additional reflective

learning practices into the curriculum (Castellano et al., 2012; Clark et al., 2010; Holstermann et al., 2010). For example, students can reflect on how and why something was successful or not, when practicing skills on typodonts[1], or in certifying with live patients through an evaluation system used in the classroom. Such an evaluation system involves students completing a self-evaluation, peer evaluation, and finally having an instructor evaluation of multiple dental lab skills. This multi-tiered evaluation process promotes reflective thinking by repetition and critical review of the procedures.

Moreover, students could use a technological tool that not only allows them to reflect on the success or failure of their technique but also further aids in connecting theory with actual practice, while promoting a collaborative team-like work environment (Garrison, Anderson, & Archer, 1999). One such technological tool that could be beneficial in this classroom environment is a blog. Using a blog technology as a teaching tool can create a learner-centered environment that improves social interaction and achievement (Ciampa, 2014; Goldman et al., 2008). By using a familiar technology, students can reflect on their learning experiences on a digital platform with classmates as their audience (Halic et al., 2010).

As digital learning tools make their way into classrooms, teachers are adapting their instruction to accommodate these inevitable changes. However, a lesson on digital citizenship and literacy should be integrated into classrooms using a digital platform (Ribble, Bailey, & Ross, 2004). This can ensure student familiarity with digital learning platforms and their capabilities. Using a blog, which is a platform used to communicate with the digital world (Byrd, 2017), as a teaching tool not only benefits the students, it is advantageous for the teacher. Teachers can use digital tools, such as blogs, to get a sense of student learning due to the

[1] A replica of the natural dentition and alveolar mucosa used in training dental professionals. Medical Dictionary © 2009 Fairfax and Partner

archiving feature a blog offers (Ciampa, 2014; Fox & Lenhart, 2006; Halic et al., 2010). Additionally, integrating a blog into curriculum can create a collaborative learning environment, or Community of Inquiry (Garrison et al., 1999). As education progresses into the future, it will become evident that digital teaching tools are a necessity.

Blog use as a teaching tool can improve student engagement, collaborative thinking, and achievement through reflective learning techniques (Ciampa, 2014; Halic et al., 2010). Teachers can use blogs to engage students in the technology they are familiar with, while making learning meaningful. Although blogs have been utilized in traditional classrooms, research has not studied effects of blog use in the dental assisting classroom setting. Given the ubiquitous nature of technology and the successes in their use in traditional classrooms (Ciampa, 2014; Gikas & Grant, 2013; Goldman et al., 2008), utilizing a blog in a dental assisting classroom setting is worth examining.

Technology as an educational tool has had a substantial influence on students and educators at many levels (Ciampa, 2014; Hwang et al., 2015). This study focused on the value of technology as a teaching tool, and how it can affect student achievement. The dental field has a moderately high technology base, and while dentists in training receive technology instruction in various forms, dental assisting students have access to fewer dental education technologies. Due to the lack of research in the field of dental assisting, this study centered on how a technology infused curriculum can affect dental assisting students' achievement.

Method

Research Question

Does a technology intervention using a blog affect dental assisting students' achievement?

Hypothesis

Research has demonstrated that a technology integrated curriculum improves student achievement (Gulek & Demirtas, 2005; Martin & Ertzberger, 2013; Wenglinsky, 1998; Yang & Wu, 2012). Based on this research it is hypothesized that students in the treatment group will perform higher on the post-test than those in the control group, thus demonstrating improved overall growth due to the reflective blog activity.

Research Design

This study was a quantitative quasi-experimental pretest/post-test research design. The sample was purposeful in that subjects were specifically students in a dental assisting program. The students were separated into two lab groups, meeting on two separate days during the week. Students registered themselves for lab class, making the treatment group somewhat random. One group was the control, and did not receive the intervention. The other was in the treatment group and was exposed to the intervention.

Independent variable. For this experiment, a technology intervention was introduced. The technology intervention was a blog created for this experiment by the researcher. A blog is an interactive website in which an author shares thoughts, comments, and experiences (Byrd, 2017). In this experiment the blog acted as a digital, collaborative learning platform where students could reflect and make meaning of course content with each other as the interactive audience (Ciampa, 2014; Martin & Ertzberger, 2013; White, Shimoda, & Fredericksen, 1999).

Dependent variable. The dependent variable was achievement, demonstrated by an analysis of overall pre-test/post-test scores and achievement gains between both groups (Dimitrov & Rumrill, 2003). Student achievement can be defined as an instructional strategy used to increase students' knowledge over time (Marzano, Pickering, & Pollock, 2001). At the

end of the experiment, pretest/post-test scores from the control group and the treatment group were compared to assess achievement.

Setting and Participants

The setting of this study was a fully accredited post-secondary school located in central California, offering a wide variety of degree and certificate programs, and serving students from seven neighboring communities. The overall student body was just over 9,000 students, with approximately 74% attending classes part-time. The setting for this study was a Dental Assisting Program with a 92% full-time student body. The number of participants in the intervention was 10 adult students in post-secondary school, the other 14 participants, from the same school, were in the control group; 24 total with combined treatment and control groups.

Participants were selected due to their enrollment in a post-secondary dental assisting program. There were 23 females and 1 male in the combined groups. The intervention group was composed of only female students. In treatment and control groups combined, 66% of students reported to be in the age range of 18-24, 25% reported 25-34 years. One student reported being in the 45-55 age range, and one chose not to answer. Participant ethnicity was reported as 63% Hispanic, 16% Caucasian, one Pacific Islander, one other, and three chose not to answer. Participants reported gender as 88% female and one male, and two choosing not to answer,

Measures

The measure for this study was a pretest/post-test design with questions selected from Dental Board of California approved curricula. This measure was well suited for research designs that utilize an experimental group that is subject to an intervention, and results are compared against a control group not exposed to the intervention (Dimitrov & Rumrill, 2003).

The pretest/post-test measured content was directly related to the intervention and covered course content for the weeks of the study (see Appendix A and B).

Students were given approximately fifteen minutes to complete the pretest (in week one) and the post-test (in week five). The pretest/post-test was multiple-choice and included fifteen questions. The questions came from Dental Board of California approved curriculum presented by the California Association of Dental Assisting Teachers (CADAT) and Modern Dental Assisting (Bird & Robinson, 2013). The same test questions were used for both tests; however, questions were reorganized from pretest to post-test to decrease chances for question memorization.

Validity. The dependent variable was student achievement (Gulek & Demirtas, 2005). The pretest/post-test method was a valid form of measurement because it measured the prior knowledge students have of dental specialties at the beginning of the class (pretest), and then again after the experiment (post-test). These tests were given to both the control group and the intervention group. Questions were pre-selected by the program director to include the content covered during the five-week experiment.

Reliability. The pretest/post-test assessments were scored using an online answer key provided by Modern Dental Assisting (Bird & Robinson, 2013). High reliability in scoring of the assessments was ensured due to the appropriate source generated answer key. Pretest/post-tests were graded by the researcher and program director, ensuring inter-rater reliability.

Intervention

This study introduced a blog as the intervention. A blog, the shortened term for weblog, is a website or web page typically managed by one person. Its purpose is to create conversation and share thoughts among a global audience (Byrd, 2017). The blog in this study was essentially

an edublog; a blog used for educational purposes (What is Edublog, 2017.). The audience members included only those in the treatment group, the program director, and the researcher. The researcher created a password-protected account, and added students using randomized codes once students were given the site information (i.e., Seesaw). Security was ensured due to the design of the Seesaw site; only the researcher was allowed to add students to the site.

The blog option chosen by the researcher was called *class feed*. This option creates a blog platform that could only be seen by the researcher and the class participants, and was not a public blog platform. The blog for this project was used as a weekly homework assignment where students posted inquiries or concerns that related to the weekly lab class. The blog served as a reflective learning post (Halic et al., 2010; Mezirow, 1990); its intention was to increase achievement for the treatment group. The blog reflection exercise was repeated over three weeks in a five week experiment, with the first week including an in class pretest, and the last week including the post-test covering the same material, but in randomized order. Results of the post-tests from each group were used to compare and assess intervention outcomes.

Procedures

Both groups began with the same pretest. After the pretest, the control group received standard or typical classroom instruction. The treatment group was briefed on instructions for the blog component, which was followed by an explanation of digital citizenship. Lastly, Seesaw and its assignment purpose was described to the treatment group participants. Participants were then given instructions on how to join Seesaw, and take part in the weekly reflective activities. Instruction and description took approximately thirty minutes from the first day of class.

Data collection. In the beginning of the study both groups took a pretest consisting of questions from the National Dental Board and Dental Board of California approved curriculum

(Bird & Robinson, 2013). At the end of the intervention, each group took a post-test consisting of the same questions in the pretest. No data were collected during the middle weeks of the study.

Fidelity. To establish fidelity during this study, the researcher co-taught treatment and control groups. The Dental Board of California requires a 7:1 student/teacher ratio for lab classes; being that both groups included over seven students, two instructors were required to teach both sections, making fidelity 100% in this study. The second instructor confirmed that the intervention was not given to the control group.

Ethical Considerations

This intervention study posed no threat of bodily harm to any of its participants. The intervention assignment was not worth additional points toward participant GPAs, therefore avoiding an unfair balance in overall GPA during and after the study. Due to the digital communication component of the intervention, participants in the treatment group were required to view a short video on digital citizenship/literacy ("Digital Etiquette" 2017.) to ensure participants had an understanding of online responsibility and digital manners (Ribble et al., 2004). This video was linked into the blog intervention, and was accessible to all treatment participants.

Validity threats. The sample for this study was chosen largely because the participants had the same educational goal of becoming dental assistants. Consequently, this convenience sample did not include bias because the entire class was participating. If participants were absent, or chose not to participate in the pretest/post-test, their data were not included in the final analysis.

Data Analysis

All data were entered into the Statistical Package for the Social Sciences® (SPSS®) for Windows, version 24.0.0 (SPSS, 2016). No names or identifying information were included in the data analysis. Before analyses were conducted all data were cleaned to ensure no outliers were present (Dimitrov, 2012). After cleaning the data, the final sample size was 10 participants for the treatment group and 14 participants for the control group.

Independent (control and treatment groups) and paired (pretest and post-test) sample t-tests were conducted to determine the significant difference in achievement between the mean paired sample t-test scores after a blog technology intervention. Further, before interpreting the analytical output, Levene's Homogeneity of Variance was examined to see if the assumption of equivalence had been violated (Levene, 1960). If Levene's Homogeneity of Variance was not violated (i.e., the variances were equal across groups), data was interpreted for the assumption of equivalence; however, if the variances were not equal across groups the corrected output was used for interpretation.

Results

Two independent samples t-tests were conducted on the whole sample (n = 24) for both the pre and post assessment scores. Results of the pretest were: Levene's Homogeneity of Variance was not violated ($p > .05$) meaning the variance between groups was not statistically different and no correction was needed, and the t-tests showed non-significant differences between the mean scores on the pretests between the two groups, $t(22) = 1.74$, $p > .05$. Therefore, the mean scores between the groups were not statistically different and the two groups were comparable (see Table 1).

Results for the post-test were: Levene's Homogeneity of Variance was not violated ($p > .05$), meaning the variance between groups was not statistically different and no correction was needed, and the t-test showed non-significant differences between the mean scores on the post-tests between the two groups, $t(22) = -.12$, $p > .05$. Meaning that there was no significant differences between groups on the post-test. This finding does not support the original hypothesis that students in the treatment group would perform higher on the post-test than those in the control group.

Table 1

Results of Independent Samples T-Tests

	Mean	SD
Pre Test		
Treatment	53.30	9.51
Control	60.57	10.46
Post-test		
Treatment	73.40	12.18
Control	72.86	10.22

Note. SD = Standard Deviation.

After determining the differences between pre and post assessment scores between groups, two paired t-tests were run for both groups (i.e., treatment and control) to determine if participants mean scores from pre to post were significantly different within each group (see Table 2). Results for each group were as follows: treatment group, $t(9) = -7.05$, $p < .001$; control group, $t(13) = -3.5$, $p < .05$, showing that both groups showed a statistically significant difference between the scores of the pre and post-test. Further, the negative t value for each analysis demonstrate that both groups increased their scores from the pretest to the post-test. More specifically, these results indicated a 20 point increase from pre to post-test in the treatment

group, and a 12 point increase in the control group. Although this does not fully support the hypothesis since the post-test scores were not statistically significantly across groups, the increase in scores does partially support the use of the intervention. Standard deviations for both groups in both sets of t-tests were high due to the wide range of scores received for pre and post-tests.

Table 2

Results of Paired T-Tests

	Mean	SD
Treatment		
Pre	53.30	9.511
Post	73.30	12.18
Control Group		
Pre	60.57	10.46
Post	72.86	10.22

Note. SD = Standard Deviation.

Discussion

The purpose of the study was to determine if achievement for dental assisting students increased for the treatment group receiving the blog intervention using Seesaw, compared with the control group receiving traditional instruction. The treatment group receiving the intervention consisted of 10 students, and the control group consisted of 14 students. Independent samples t-test results showed that both treatment and control groups were not statistically different, meaning their pretest scores were similar; and due to the grading range being 0%-100%, standard deviation was considerably high for both groups in both pre and post-tests. This reiterates that both groups were not statistically different, thus making them reasonable to compare.

Results of the paired samples t-tests suggest that the Seesaw blog intervention increased achievement for the treatment group. While both group's scores increased from pre to post-test, the treatment group had a 20 point improvement in scores, and the control group improved by 12 points. Although the literature suggests that a technology intervention can improve student achievement, minimal participation in this study's intervention neglects to explain these claims. Though there was a deficit in intervention participation, the increase in achievement overall shows gains in student content knowledge. These results only partially support the original hypothesis since the treatment group did not have a statistically significantly different post-test score than the control group.

The results aligned with the literature and helped develop the researcher's hypothesis that students in the intervention group had an increase in achievement. In conjunction with previous studies, findings may reveal a connection that a technology intervention can improve student achievement (Martin & Ertzberger, 2013; Yang & Wu, 2012). Using Seesaw as a digital platform for the intervention group, students reflected on skills learned, thus engaging them further in course content (Gikas & Grant, 2013). Although there is a paucity of research about using blogs in an educational setting (Halic et al., 2010), particularly for dental assisting students, using technology tools can have positive student outcomes (Martin & Ertzberger, 2013; Yang &Wu, 2012). For this reason, educators, parents, and students alike can find value in knowing that technology-based teaching tools are contributing to student achievement.

Limitations and Future Studies

The major limitations in this study center around the scarcity of student participation in the intervention. Being that there were no points or grades attached to participating in the blog, participation was minimal. Therefore, interpretation of findings must be done cautiously as it is

difficult to draw causal links to the improvement in scores and participation in the blog intervention. If this study were to be replicated, a point system might be added to the intervention to ensure complete participation.

A second limitation in this study was that students from the control group could attend the treatment group lab class if they needed to make up their lab class earlier in the week. This limited the study to only out of class participation in the blog intervention, contributing to low incentives for participating. For future research, it is suggested that the blog intervention be integrated into the curriculum. Additionally, this study used a small convenience sample, making the results difficult to generalize to the population as a whole; therefore, using a more randomized sampling method may lead to different results.

Recommendations for further studies would be to create a point system for intervention participation that would encourage students to participate with the blog as designed. Furthermore, allowing students to participate in the blog inside and outside of the classroom may increase participation (Martin & Ertzberger, 2013) because students would be able to reflect with more immediacy if in class participation were permitted. Further, additional class time should be dedicated to using Seesaw since not all students are tech savvy. With this, students can be comfortable with its use and purpose even if they are not as astute with technology as other students.

Summary

By integrating digital learning platforms into curriculum, student engagement increases (Quaye & Harper, 2014) along with inquiry-based learning. In shifting the antiquated instructional style from direct instruction to learner-centered inquiry-based instruction that is meaningful and relatable, students can learn to develop their love of learning and gradually

advance up the Bloom's taxonomy pyramid (Forehand, 2010). This advancement in Bloom's taxonomy indicates a higher level of achievement; the amalgamation of engagement in learning and achievement using technology-based instructional tools (Ciampa, 2014) can facilitate a generation of successful critical thinkers with a life-long love of learning. Given that the digital future is happening now, integrating meaningful, relatable technology into the classroom is a reasonable sentiment.

The goal of education is to increase achievement and foster a life-long love of learning for our future generations. Technology is ubiquitous and ever-changing; integrating a technology component into today's classrooms not only improves instruction by reaching diverse learners, it prepares learners for careers and life in the twenty first century (Kuhlthau, Maniotes, & Caspari, 2015). Dental assisting students work in technologically dynamic environments that require a more than novice technological ability. Incorporating technology components as instructional tools into dental assisting classrooms can make learning meaningful and engaging. Relevant and modern instructional tools support the constructivist learning approach by making students active learners, gaining both collaborative and individual problem-solving skills, empowering them to take interest and have control of their achievement.

References

American Dental Association. (2017). *Careers in Dentistry.* Retrieved from http://www.ada.org/en/education-careers/careers-in-dentistry/dental-team-careers/dental-assistant

Atkins, M. J. (1993). Evaluating interactive technologies for learning. *Journal of Curriculum Studies*, *25*, 333-342. doi:10.1080/0022027930250403

Bertolami, C. N. (2007). Creating the dental school faculty of the future: A guide for the perplexed. *Journal of Dental Education*, *71*, 1267-1280.

Bird, D. L., & Robinson, D. S. (2013). *Modern dental assisting*. St. Louis, MO: Elsevier.

Brame, C. J. (2014). Team-based learning. What is it? *Vanderbilt Center for Teaching.* Retrieved from http://cft.vanderbilt.edu/guides-sub-pages/team-base d-learning.

Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies & academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, *27*, 1-13.

Byrd, K. (2017). What Is a Blog? Retrieved from http://blogbasics.com/what-is-a-blog/

Castellano, M., Sundell, K., Overman, L. T., & Aliaga, O. A. (2012). Do career and technical education programs of study improve student achievement? Preliminary analyses from a rigorous longitudinal study. *International Journal of Educational Reform*, *21*(2), 98-118.

Cheng, A., Lang, T. R., Starr, S. R., Pusic, M., & Cook, D. A. (2014). Technology-enhanced simulation and pediatric education: A meta-analysis. *Pediatrics*, *133*(5), 159-165.

Ciampa, K. (2014). Learning in a mobile age: an investigation of student motivation. *Journal of Computer Assisted Learning*, *30*(1), 82-96. doi: 10.1111/jcal.12036

Cima, R. R., Brown, M. J., Hebl, J. R., Moore, R., Rogers, J. C., Kollengode, A., ... & Team, S. P. I. (2011). Use of lean and six sigma methodology to improve operating room efficiency in a high-volume tertiary-care academic medical center. *Journal of the American College of Surgeons*, *213*(1) 83-92.

Clark, R. W., Threeton, M. D., & Ewing, J. C. (2010). The potential of experiential learning models and practices in career and technical education & career and technical teacher education. *Journal of Career and Technical Education*, *25*(2), 1-17. doi:10.21061/jcte.v25i2.479

Dental Board of California. (2016). *Welcome to the Dental Board of California*. Retrieved January 29, 2017 from http://www.dbc.ca.gov/index.shtml

Derry, S. J. (1996). Cognitive schema theory in the constructivist debate. *Educational Psychologist*, *3*, 163-174.

Dewey, J. (2007). *Experience and education*. New York, NY: Simon and Schuster.

"Digital Etiquette". (2017). *BrainPOP.* Accessed from https://www.brainpop.com/technology/freemovies/digitaletiquette/

Dimitrov, D. M. (2012). *Statistical methods for validation of assessment scale data in counseling and related fields*. Alexandria, VA: American Counseling Association.

Dimitrov, D. M., & Rumrill Jr, P. D. (2003). Pretest-post-test designs and measurement of change. *Work*, *20*, 159-165.

Donaldson, M. E., Gadbury-Amyot, C. C., Khajotia, S. S., Nattestad, A., Norton, N. S., Zubiaurre, L. A., & Turner, S. P. (2008). Dental education in a flat world: Advocating for increased global collaboration and standardization. *Journal of Dental Education*, *72*, 408-421.

Dweck, C. S. (2010). Even geniuses work hard. *Educational Leadership*, *68*(1), 16-20.

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration?. *Educational Technology Research and Development*, *53*(4), 25-39.

Evans, J., Henderson, A., & Johnson, N. (2010). The future of education and training in dental technology; designing a dental curriculum that facilitates teamwork across the oral health professions. *British Dental Journal*, *208*(5), 227-230. doi:10.1038/sj.bdj.2010.208

Finkbeiner, B.L. (2000). Four-handed dentistry revisited. *The Journal of Contemporary Dental Practice, 1(4), 1-9.*

Forehand, M. (2010). Bloom's taxonomy. *Emerging Perspectives on Learning, Teaching, and Technology*, *41*, 1-9.

Forneris, S. G., & Peden-McAlpine, C. (2007). Evaluation of a reflective learning intervention to improve critical thinking in novice nurses. *Journal of Advanced Nursing*, *57*, 410-421. doi: 10.1111/j.1365-2648.2006.04120.x

Fox, S., & Lenhart, A. (2006). *Bloggers: A portrait of the Internet's new storytellers*. Retrieved from http://www.pewinternet.org

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education, 2*(2), 87-105.

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, *19*, 18-26.

Goldman, R. H., Cohen, A. P., & Sheahan, F. (2008). Using seminar blogs to enhance student participation and learning in public health school classes. *American Journal of Public Health*, *98*, 1658-1663. doi: 10.2105/AJPH.2008.133694

Gulek, J. C., & Demirtas, H. (2005). Learning with technology: The impact of laptop use on student achievement. *The Journal of Technology, Learning and Assessment*, *3*(2), 1-38.

Halic, O., Lee, D., Paulus, T., & Spence, M. (2010). To blog or not to blog: Student perceptions of blog effectiveness for learning in a college-level course. *The Internet and Higher Education*, *13*(4), 206-213.

Holstermann, N., Grube, D., & Bogeholz, S. (2010). Hands-on activities and their influence on students' interest. *Research in Science Education, 40*, 743-757 doi:10.1007/s11165-009-9142-0

Hwang, G. J., Chiu, L. Y., & Chen, C. H. (2015). A contextual game-based learning approach to improving students' inquiry-based learning performance in social studies courses. *Computers & Education*, *81*, 13-25.

Iacopino, A. M. (2007). The influence of "new science" on dental education: current concepts, trends, and models for the future. *Journal of Dental Education*, *71*, 450-462.

IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp.

Issenberg, SB., McGaghie, WC, Hart, IR., Mayer, JW., Felner, JM., Petrusa, ER., Waugh, RA., Brown, DD., Safford, RR., Gessner, IH., Gordon, DL., & Ewy, GA. (1999). Simulation technology for health care professional skills training and assessment. *Jama*, *282*, 861-866. doi:10.1001/jama.282.9.861

Jelas, Z. M., Azman, N., Zulnaidi, H., & Ahmad, N. A. (2016). Learning support and academic achievement among Malaysian adolescents: The mediating role of student engagement. *Learning Environments Research*, *19*, 221-240. doi: 10.1007/s10984-015-9202-5

Jiang, Q., Khan, M. K., Lu, X., Ma, J., & He, D. (2016). A privacy preserving three-factor authentication protocol for e-Health clouds. *The Journal of Supercomputing*, *72*, 3826-3849. doi: 10.1007/s11227-015-1610-x

Kelly, A. M., Bryant, M., Cox, L., & Jolley, D. (2007). Improving emergency department efficiency by patient streaming to outcomes-based teams. *Australian Health Review*, *31*(1), 16-21.

Kuhlthau, C. C., Maniotes, L. K., & Caspari, A. K. (2015). *Guided Inquiry: Learning in the 21st Century.* Santa Barbara, CA: ABC-CLIO.

Kukulska-Hulme, A. (2012). How should the higher education workforce adapt to advancements in technology for teaching and learning? *The Internet and Higher Education*, *15*(4), 247-254. https://doi.org/10.1016/j.iheduc.2011.12.002

Kumar, P., Lee, S. G., & Lee, H. J. (2012). E-SAP: efficient-strong authentication protocol for healthcare applications using wireless medical sensor networks. *Sensors*, *12*, 1625-1647. doi: 10.3390/s120201625

Lange, C. M., & Sletten, S. J. (2002). *Alternative Education: A brief history and research synthesis.* Alexandria, VA: Project Forum, National Association of State Directors of Special Education.

Levene, H. (1960). *Contributions to probability and statistics; essays in honor of Harold Hotelling*. Stanford, CA: Stanford University Press.

Martin, F., & Ertzberger, J. (2013). Here and now mobile learning: An experimental study on the use of mobile technology. *Computers & Education*, *68*, 76-85.

Marzano, R.J., Pickering, D., & Polluck, J.E., (2001) *Classroom instruction that works: Research-based strategies for increasing student achievement.* Alexandria, VA: Ascd.

McLaughlin, J. E., Griffin, L. M., Esserman, D. A., Davidson, C. A., Glatt, D. M., Roth, M. T., & Mumper, R. J. (2013). Pharmacy student engagement, performance, and perception in a flipped satellite classroom. *American journal of pharmaceutical education*, *77*(9), 1-8. doi: 10.5688/ajpe779196

McLeod, S. (2015, January). *Cognitive Theory*. Retrieved from http://www.simplypsychology.org/piaget.html

Medley, C. F., & Home, C. (2005). Using simulation technology for undergraduate nursing education. *Journal of Nursing Education*, *44*(1), 31-34.

Mezirow, J. (1990). How critical reflection triggers transformative learning. *Fostering Critical Reflection in Adulthood*, *1*-6.

Mistler-Jackson, M., & Songer, N. B. (2000). Student motivation and Internet technology: Are students empowered to learn science?. *Journal of Research in Science Teaching*, *37*, 459-479.

Mok, H. N. (2014). Teaching tip: The flipped classroom. *Journal of Information Systems Education*, *25*(1), 7-11.

Piaget, J. (1952). *The origins of intelligence in children*. New York, NY: International Universities Press.

Pressley, M., & Harris, K. R. (2008). Cognitive strategies instruction: From basic research to classroom instruction. *The Journal of Education*, *189*(1/2), 77-94.

Quaye, S. J., & Harper, S. R. (2014). *Student engagement in higher education: Theoretical perspectives and practical approaches for diverse populations*. New York, NY: Routledge.

Reyes, M. R., Brackett, M. A., Rivers, S. E., White, M., & Salovey, P. (2012). Classroom emotional climate, student engagement, and academic achievement. *Journal of educational psychology*, *104*, 700-712. http://dx.doi.org/10.1037/a0027268

Ribble, M. S., Bailey, G. D., & Ross, T. W. (2004). Digital citizenship: Addressing appropriate technology behavior. *Learning & Leading with Technology*, *32*(1), 6-9.

Robinson, R., & Mclaughlan, A., (1996). Infection control in practice. Infection control and clinical efficiency: Are they compatible? *Annals of the Royal Australasian College of Dental Surgeons, 13*, 108-114.

Schindler, L. A., & Burkholder, G. J. (2014). Instructional design and facilitation approaches that promote critical thinking in asynchronous online discussions: A review of the literature. *Higher Learning Research Communications*, *4*(4), 11-29.

Silver, H. (2013). *Education as history*. New York, NY: Methuen & Co.

The California Association of Dental Assisting Teachers. (n.d.). Retrieved from http://cadat.org/

Wenglinsky, H. & Educational Testing Service, P. C. (1998). *Does it compute? The relationship between educational technology and student achievement in mathematics.* Princeton, NJ: Educational Testing Service.

What is Edublog? (2017) Retrieved December 8, 2016, from http://www.igi-global.com/dictionary/edublog/37792

White, B. Y., Shimoda, T. A., & Frederiksen, J. R. (1999). Enabling students to construct theories of collaborative inquiry and reflective learning: Computer support for

metacognitive development. *International Journal of Artificial Intelligence in Education (IJAIED)*, *10*, 151-182.

Wonacott, M. E. & ERIC Clearinghouse on Adult, C. O. (2002). High schools that work: Best practices for CTE. Practice Application Brief No. 19.

Xie, Y., Ke, F., & Sharma, P. (2008). The effect of peer feedback for blogging on college students' reflective learning processes. *The Internet and Higher Education*, *11*(1), 18-25.

Yang, Y. T. C., & Wu, W. C. I. (2012). Digital storytelling for enhancing student academic achievement, critical thinking, and learning motivation: A year-long experimental study. *Computers & Education*, *59*, 339-352.

Appendix A

Pretest

Name _____
Date_____

1. What type of temporary cement is most commonly used on a provisional temporary?
   a. zinc oxide eugenol
   b. zinc phosphate
   c. glass ionomer
   d. polycarboxylate

2. What can be completed to avoid trauma to the prepared tooth?
   a. take provisional coverage out of occlusion
   b. do not place a provisional restoration
   c. cement provisional coverage permanently
   d. cement provisional coverage temporarily

3. What is the most common type of material used for provisional coverage?
   a. alginate
   b. self-curing acrylic
   c. light-cured acrylic
   d. IRM

4. What is the purpose of using petroleum jelly?
   a. dilutes the taste of acrylic.
   b. facilitates faster setting times.
   c. facilitates easy removal of provisional coverage
   d. gives a gloss to provisional coverage

5. What is used to check the occlusion of provisional crown?
   a. floss
   b. articulating paper
   c. matrix system
   d. abrasive strip

6. What is the term used to describe chewing?
   a. occlusion
   b. occlusal surface
   c. masticatory surface
   d. mastication

7. Which is an example of the intraoral factors influencing the choice of a removable prosthesis?
   a. residual alveolar ridge
   b. mental health
   c. patient motivation
   d. dietary habits

8. What is the term used to describe abnormal growths of bone in a specific area of the mouth?
   a. alveolar bone
   b. bone spurs
   c. tori
   d. tuberosity

9. What is the term for placing a new layer of denture resin over the tissue surface of the prosthesis?
   a. rebasing
   b. recontouring
   c. reconditioning
   d. relining

10. Which teeth are not included on a full denture?
   a. first molars
   b. third molars
   c. first premolars
   d. second premolars

11. What is the term used to describe artificial teeth that have been surgically embedded in the bone?
   a. stent
   b. implant
   c. partial denture
   d. full denture

12. The process in which a dental implant becomes attached to healthy bone is called
   a. orthognathic.
   b. alveoplasty.
   c. osseointegration.
   d. a stent.

13. What is the most common type of material used for implants?
    a. aluminum
    b. steel
    c. gold
    d. titanium

14. What is the term used to describe an implant that is inserted through the inferior border of the mandible?
    a. transosteal
    b. endeosteal
    c. peri-implant
    d. subperiosteal

15. The osseointegration period is generally _____ long
    a. 1 to 3 months
    b. 3 to 6 months
    c. 6 to 9 months
    d. 9 to 2 months

Appendix B

Post-test

Name _____
Date_____

1. The process in which a dental implant becomes attached to healthy bone is called
   a. orthognathic.
   b. alveoplasty.
   c. osseointegration.
   d. a stent.

2. Which is an example of the intraoral factors influencing the choice of a removable prosthesis?
   a. residual alveolar ridge
   b. mental health
   c. patient motivation
   d. dietary habits

3. What is the term for placing a new layer of denture resin over the tissue surface of the prosthesis?
   a. rebasing
   b. recontouring
   c. reconditioning
   d. relining

4. What is the term used to describe abnormal growths of bone in a specific area of the mouth?
   a. alveolar bone
   b. bone spurs
   c. tori
   d. tuberosity

5. Which teeth are not included on a full denture?
   a. first molars
   b. third molars
   c. first premolars
   d. second premolars

6. What is the term used to describe artificial teeth that have been surgically embedded in the bone?
   a. stent
   b. implant
   c. partial denture
   d. full denture

7. What is the most common type of material used for provisional coverage?
   a. alginate
   b. self-curing acrylic
   c. light-cured acrylic
   d. IRM

8. What is the term used to describe an implant that is inserted through the inferior border of the mandible?
   a. transosteal
   b. endeosteal
   c. peri-implant
   d. subperiosteal

9. What is used to check the occlusion of provisional crown?
   a. floss
   b. articulating paper
   c. matrix system
   d. abrasive strip

10. What type of temporary cement is most commonly used on a provisional temporary?
   a. zinc oxide eugenol
   b. zinc phosphate
   c. glass ionomer
   d. polycarboxylate

11. What is the purpose of using petroleum jelly?
   a. dilutes the taste of acrylic.
   b. facilitates faster setting times.
   c. facilitates easy removal of provisional coverage
   d. gives a gloss to provisional coverage

12. The osseointegration period is generally _____ long
    a. 1 to 3 months
    b. 3 to 6 months
    c. 6 to 9 months
    d. 9 to 2 months

13. What is the term used to describe chewing?
    a. occlusion
    b. occlusal surface
    c. masticatory surface
    d. mastication

14. What can be completed to avoid trauma to the prepared tooth?
    a. take provisional coverage out of occlusion
    b. do not place a provisional restoration
    c. cement provisional coverage permanently
    d. cement provisional coverage temporarily

15. What is the most common type of material used for implants?
    a. aluminum
    b. steel
    c. gold
    d. titanium

Demographic Questions

What is your age range?
1) 18-24 3) 35-44
2) 25-34 4) 45-55
7) Prefer not to answer

With which ethnicity do you identify?
1) White 2) Hispanic or Latino 3) Black or African American
4) Native American or American Indian
5) Asian 6)Pacific Islander 6) Other
7) Prefer not to answer

With which gender do you identify?
1) Male
2) Female
3) Transgender
4) Prefer not to answer