The Integration of Research into U.S. Dental Hygiene Curriculums.

THESIS

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By

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Abstract

**Purpose:** The Commission on Dental Accreditation (CODA) implements specific standards concerning knowledge of research ethics, evaluation of scientific literature, and evidence based care. The purpose of this descriptive study was to survey U.S. dental hygiene program directors to determine: 1) if research is being taught in dental hygiene programs and 2) to what capacity research is being taught in dental hygiene programs.

**Methods:** Data were gathered via an electronic survey sent to 335 U.S. dental hygiene program directors. This survey included 18 closed-ended questions. The survey invitation was e-mailed three times, achieving a 25.7% total response rate (n=86). Data were evaluated using descriptive statistics and Fisher’s exact test was used to statistically analyze the relationships between various groups.

**Results:** The majority (71%, n=61) of the responding institutions offered an associate degree, followed by a baccalaureate degree (40%, n=34). However, there were more respondents from baccalaureate degree programs in comparison to the total population. Sixty-one percent of all baccalaureate programs in the U.S. responded to the survey, whereas 21% of all associate degree programs responded. Ninety-three percent (n=80) of the respondents indicated that research is taught in the dental hygiene curriculum. Forty-six percent (n=36) of responding institutions offered research as a stand-alone course. There was a greater likelihood of a stand-alone research course occurring in
baccalaureate programs (p≤0.0001). The majority of responding institutions did not have faculty (55%, n=47) or students (65%, n=56) conducting original research. Associate degree programs (40%, n=12) reported the highest rate of students conducting research, followed by baccalaureate programs (23%, n=7) and baccalaureate and graduate degree programs (20%, n=6). Baccalaureate programs (33%, n=13) had the highest rate of faculty producing original research. Faculty were more likely to perform research when the hygiene program was housed with a DDS or DMD program (p=<0.0001). Among responding institutions with a DDS or DMD program (n=12), 42% (n=5) have students conducting original research.

**Conclusion:** The results of this descriptive study suggest that research is taught at associate, baccalaureate, and graduate levels of dental hygiene education. Although, most responding institutions did not have faculty or students conducting original research. In addition, the majority of responding institutions did not offer research as a stand-alone course. This may indicate that students are taught only certain facets of the concept of research, predominantly evidence-based decision making (EBDM) and research methods and design. This study, along with previous research, indicates that the integration of research into dental hygiene curricula requires further analysis. The efficacy of teaching research in a stand-alone course versus in a combined course should be assessed, as well as faculty interests and values on research and instructional techniques. After these aspects have been evaluated, national leaders can determine proper curricular changes to ensure that research is adequately integrated into dental hygiene curricula.
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Chapter 1: Introduction

Background of the Problem

According to the American Dental Hygienists’ Association (ADHA), dental hygienists play an integral role in the prevention, intervention, and control of oral disease. Dental hygienists have six primary responsibilities.¹ These include assessing, diagnosing, planning, implementing, evaluating, and documenting dental treatment. Research plays a role in each of these processes. An anecdotal approach is not the most scientific or reliable basis for decision-making.² In order for oral hygiene recommendations and treatment to be based on evidence, scientific research is crucial. Understanding evidence-based (EB) practice allows for individualized care, as one modality does not fit every patient.

Significance of the Problem

The concept of EB practice is a long-standing issue in dental hygiene education. Chichester et al. found that dental hygiene educators had made only small strides in forming an EB philosophy dental hygiene curricula.³ Forrest and Miller concluded that those involved in dental hygiene education needed training in evidence-based decision making (EBDM) skills and concepts before the method could be fully incorporated into
education or utilized to direct research studies. While the scope and depth of research taught among schools varies, there are also dental hygiene programs that do not include research of any kind in their curriculums. Forrest and Miller cited lack of faculty skills as the leading barrier.

Additionally, studies have revealed that EBDM is necessary in healthcare education. Beistle and Palmer asserted that in order to utilize the most effective and modern teaching methods, dental education reform is necessary. Beistle and Palmer also affirmed that clinical and didactic dental education are in need of modernization and significant curricular change. The dental education community, including the Commission on Dental Accreditation (CODA), have also acknowledged the need for dental education reform to enhance the oral health of U.S. citizens. In order for national leadership to establish research strategies and promote curricular changes, a study must be conducted to reveal the current state of research integration in dental hygiene programs. This study examined the existence of research content in dental hygiene programs and if taught, the scope and depth of its content.

**Purpose of the Study**

The purpose of this study was to investigate the extent of research in dental hygiene curriculums. The specific objectives of this study were to: 1) determine if research is being taught in dental hygiene programs and 2) determine to what capacity research is being taught in dental hygiene programs.
It was hypothesized that: 1) the majority of U.S. dental hygiene programs incorporate research into their curricula; 2) baccalaureate level and graduate programs integrate more extensive amounts of research than non-baccalaureate programs; and 3) EBDM is the most commonly taught research topic.

For the purpose of this study, it was assumed that the data collected from the dental hygiene program directors was complete and accurate. Research was broadly used to include the true conduction of research and the teaching of EBDM.

Research Questions

1) Is research being taught in U.S. dental hygiene programs?
2) To what capacity is research being taught in U.S. dental hygiene programs?

Definitions of Terms

1. Research is defined as findings that contribute to an overall body of knowledge obtained from various studies examining the same subject.4
2. Evidence-based decision making (EBDM) is defined as employing scientific evidence, patient preferences or values, clinical/patient circumstances, and experience and judgment to make the best possible patient care choices.4
3. Evidence is the “synthesis of all valid research studies that answer a specific question.”

4. Critical thinking is defined as the ability to assess information, define a problem, draw a conclusion, devise possible solutions, create a plan of action, and evaluate whether the idea or plan worked.”

For the purpose of this study, the term “research” was used as defined in number 1 and 2 above.
Chapter 2: Review of the Literature

Limited research has previously been conducted to determine the curricular utilization of research in dental hygiene education, in both baccalaureate and non-baccalaureate U.S. dental hygiene programs. However, studies exist in regards to critical thinking, EB philosophies, and curriculum reform in dental hygiene education.

Critical Thinking

Frantsve-Hawley et al. affirmed that critical thinking is the primary aim of EBDM. They described five steps to applying EBDM: 1) Make the question; 2) Access the evidence; 3) Appraise the evidence; 4) Apply the evidence; and 5) Assess the outcome. The fifth step, assessing the outcome, is where critical thinking is applied. A dental hygienist requires critical thinking skills, in order to determine the best treatment modalities in oral care and to evaluate whether or not the selected course of action was successful.

Moreover, Beistle and Palmer conducted a study in which 20 faculty members were surveyed, from 14 accredited associate degree dental hygiene programs in one midwest state. The investigation found that only 25% of dental hygiene faculty members could provide a complete definition of critical thinking. The Institute of Medicine
asserted that all healthcare professionals should be instructed to provide patient-centered care, employing critical thinking skills. The participants in the study agreed that faculty development opportunities and calibration of instruction were existing needs. In addition, they agreed that more time was needed to teach and build critical thinking skills into curricula. The authors asserted that existing research proves the development of critical thinking involves several levels, as well as the necessary amount of time to complete those levels. The participants in the study communicated willingness and understanding, but admitted that they did not have the time to adjust their coursework.

The participants also described challenges with teaching today’s students. Faculty members reported experiencing resistance from students who did not want to participate in teaching strategies to stimulate critical thinking. It was uncovered that many students “just wanted to be spoon fed” in order to know what is on board examinations.

Without critical thinking, standardized dental hygiene treatment can yield poor, ineffective care. Mitchell et al. concurred that it is imperative for critical thinking to be a primary element in dental hygiene curricula. They stated that optimal patient care depends on the incorporation of critical thinking. Evidence-based decision making in dental hygiene curricula assists the development of critical thinking skills. Mitchell et al. affirmed that critical thinking skills and EBDM are interlinked and “mutually inclusive.”

Furthermore, Cobban conducted a study on the professionalism of dental hygiene and revealed that students who were proficient in evaluating evidence and scientific literature were more meticulous in their treatment decisions. Therefore treatment decisions play an important role in honoring the Hippocratic Oath, which tells medical
professionals to “Do no harm.” In addition, the ADHA Code of Ethics specifically outlines non-maleficence and beneficence as required core values.\textsuperscript{10} Non-maleficence also signifies “Do no harm” and beneficence denotes the professional duty to promote the well-being of others.\textsuperscript{10} Through the evaluation of scientific literature and evidence, dental hygienists can gain enhanced understanding of disease etiology and progression. It also helps dental hygienists understand the benefits, risks, and efficacy of products and treatment modalities. Clinical dental hygienists can use their knowledge from scientific literature to think critically, evaluate evidence, and provide patients with the best possible treatment options.

Katz stressed that critical thinking skills must be taught early and repeatedly in dental education, in order for students to acquire the knowledge and skills necessary to effectively utilize EB practice.\textsuperscript{11} Katz developed a four-year curriculum model for building critical thinking skills at New York University College of Dentistry. After the first four years of the implementation of the curriculum, it was found that students acquired all requisite skills at a high success rate.\textsuperscript{11} Only a single student, out of 1,400 students, failed out of the College.\textsuperscript{11} Katz’s study suggested that critical thinking can be efficiently integrated into dental curricula.

Additionally, Chichester et al. stated the introduction and integration of the critical appraisal process by dental hygiene students when evaluating research must be revised.\textsuperscript{3} They asserted that dental hygiene programs must reject the conventional idea that all learning should be accomplished under the direction of an instructor.\textsuperscript{3} They
determined that programs should urge students to independently review scientific studies, evaluate the validity of results, and question the efficacy of conventional dental hygiene interventions.\(^3\)

**Evidence-Based Philosophies**

Chichester et al. evaluated the curricular utilization of EB philosophies in dental hygiene education in both baccalaureate and non-baccalaureate U.S. dental hygiene programs. They found that baccalaureate programs incorporate fundamentals of research at a greater level than non-baccalaureate programs.\(^{12}\) They determined 62% of baccalaureate programs provided a separate course on research, while only 14% of non-baccalaureate programs had a separate course.\(^{12}\)

Also, 86% of baccalaureate programs and 61% of non-baccalaureate programs encouraged students to give patients advice based on evidence and instructed students to employ evidence in clinical situations.\(^{12}\) Non-baccalaureate programs demonstrated less use of evidence in clinical situations, including actual patient treatment.\(^{12}\) These findings contribute to the debate surrounding the appropriate degree necessary for entry-level dental hygiene.

Moreover, Frantsve-Hawley et al. discussed three realms involved in EBDM.\(^6\) They asserted that science, clinician judgment, and patient preferences work together to facilitate EBDM. Patient-centered care requires individualized healthcare decisions. Katz agreed, as he discussed the significance of employing EB practice wisely.\(^{11}\) He asserted
that clinical expertise must be simultaneously involved, as evidence alone may be inappropriate for an individual patient. Cobban confirmed that cost-effective healthcare and the quality of clinical decisions are improved by the implementation of evidence. Cobban emphasized that the intent of EB practice is to improve health outcomes.

The National Center for Dental Hygiene Research and Practice (NCDHRP) maintained a fervent stance on the importance of incorporating EBDM into dental hygiene curricula. The NCDHRP Educator’s Guide to Teaching Research and EBDM stated that the application of evidence defines the quality of dental hygiene treatment, as well as life-long learning. This guide also asserted that those who understand the research process may be more interested in advanced degrees and in becoming dental hygiene scholars. The NCDHRP explained that teaching EBDM reaches beyond the walls of clinical practice. It facilitates the protection of the profession, as it promotes higher education and produces leaders in the field.

In addition, Cobban discussed the importance of incorporating EBDM into dental hygiene education. She stated that strategies to achieve this integration begin with faculty. She expressed that instructors must possess EB practice skills and they must use teaching methods that promote the development of problem-solving skills among students. The National Forum on Health made a powerful statement about EBDM, asserting that evidence is meaningless if it is not implemented. Cobban agreed, emphasizing that a culture of dental hygienists who apply EB practice are critical for the field of dental hygiene. Mitchell et al. also concurred, expressing that dental hygienists
who master EBDM skills have the ability to apply appropriate evidence to clinical situations and to discern between assertions that are and are not supported by evidence.  

Chichester et al. revealed that students educated with an EB teaching approach possess higher level reasoning skills, are more proficient at using critical thinking strategies, are more self-directed, and are life-long learners. Chichester et al. also discovered four major barriers for fully integrating an EB approach in dental hygiene programs: 1) lack of faculty skills; 2) no available time; 3) lack of financial resources; and 4) lack of technical support. These challenges are consistent with the aforementioned research by Beistle and Palmer. Instructors are often so overloaded with work that they cannot keep up without working overtime. These additional hours are frequently devoted with no compensation. Training and curriculum changes would greatly compound this already intense workload.

Curriculum Reform

By the 21st century, Forrest and Miller declared that dental hygiene curricula needed to be transformed. They recognized a need to better prepare students to integrate EBDM into clinical practice. Current researchers have continued to express the same need. Beistle and Palmer stated that dental programs often encompass a curriculum that is overloaded, with a restricted amount of time to deliver content. They also acknowledged
that dental programs often include redundant material and do not provide the opportunity for unique educational experiences that cultivate critical thinking skills.\textsuperscript{5}

There are various regulations surrounding dental hygiene curricula. The NCDHRP stated that content in regards to EBDM and scientific literature is required throughout every level of dental hygiene education.\textsuperscript{13} The CODA standard 2-19 states that graduates must be competent in the application of the principles of ethical reasoning, ethical decision making, and professional responsibility as they pertain to the academic environment, research, patient care, and practice management.\textsuperscript{14} Also, CODA standard 2-22 states that graduates must be competent in the evaluation of current scientific literature.\textsuperscript{14} In addition, CODA standard 2-23 states that graduates must be competent in problem solving strategies related to comprehensive patient care and management of patients.\textsuperscript{14}

Nonetheless, questions still abound in regards to what should be included at each level of dental hygiene education. The NCDHRP asserted that each level of education should expand on the research skills achieved in the previous level.\textsuperscript{13} In entry-level dental hygiene education, students should learn how to navigate research databases, locate literature, utilize scientific evidence, and learn dental indices to measure oral health outcomes.\textsuperscript{13} As the education level progresses, students should be able to identify research methods, critically analyze research, and conduct research.\textsuperscript{13}

The integration of EBDM into dental hygiene education is a work in progress. Researchers outlined the need to incorporate critical thinking and EB philosophies into teaching. Some studies also suggested an overhaul of the curriculum.\textsuperscript{3,4,11,12} With
constraints on time and training, as well as the existence of accreditation requirements, curricular changes are laborious and slow at best.
Chapter 3: Methods

This research focused on the integration of research into U.S. dental hygiene curriculums. This study examined how and to what capacity research is taught. In addition, the survey disclosed the dental research topics and ethical considerations that are incorporated into dental hygiene curriculums. Moreover, this investigation assessed the degree to which faculty and students conduct original research.

Research Design

This study employed a survey/questionnaire that provided a close look at whether or not dental hygiene schools are incorporating research into their curriculums. It also identified to what capacity research is being integrated. By comparing and analyzing this information, a conclusion can be made to help national leaders establish research strategies and promote curricular changes. This study was determined exempt by The Ohio State University Institutional Review Board.

Subject Selection

The survey was electronically sent to 335 dental hygiene program directors in the U.S. Program directors acquire the most knowledge about their specific program,
including administration, student information, statistics, and curriculum. All subjects could choose not to participate in the study. According to the ADHA 2014 Dental Hygiene Program Surveys, there are 288 associate degree dental hygiene programs, 56 baccalaureate degree programs, and eight certificate programs. These totals do not equal 335, because 17 programs offer multiple degree and/or certificate options.  

**Data Collection**

An online survey software (Qualtrics, Provo, UT) was utilized to distribute and initially analyze the survey. The survey software includes sophisticated security measures and the program directors that completed the survey were not identified. Therefore, there was minimal risk for any of the participants. The survey consisted of 18 questions and took roughly 20 minutes to complete.

**Statistical Analysis**

Data were analyzed using descriptive statistics. In addition, Fisher’s exact test was used to compare: highest degree offered and whether or not research was taught; highest degree offered and stand-alone or combined research course; faculty research and
the existence of a DDS or DMD program; and student research and the existence of a DDS or DMD program.
Chapter 4: Results and Discussion

The electronic survey was e-mailed to 335 dental hygiene program directors in the U.S. The survey generated 93 responses, totaling a 28% response rate. Seven programs were not used due to incomplete forms. Two programs corrected a mismark answer that was verified elsewhere in the data. Three programs had conflicting responses for question 15, therefore data from that question was not used. Two programs returned entirely blank surveys. The resulting 86 responses were used in the analysis. Not all schools responded to all questions.

In this study, the response rate was weighted towards baccalaureate programs, therefore it was not representative of the population of dental hygiene programs as a whole. In the U.S., there are 56 (17% of all dental hygiene programs in the U.S.) baccalaureate degree programs and 288 (86% of all dental hygiene programs in the U.S.) associate degree programs. This study yielded responses from 61% (n=34) of all baccalaureate programs in the U.S. and 21% (n=61) of all associate programs in the U.S. (Table 1).

The majority (71%, n=61) of the responding institutions offered an associate degree, followed by those offering a baccalaureate degree (40%, n=34) (Table 2). These totals include programs that offer multiple degree options. Some institutions offer both associate and baccalaureate degree programs, therefore respondents may have selected
more than one option. Over half (52%, n=45) of the respondents were from community colleges (Table 3). A small fraction (15%, n=12) of institutions were affiliated with a DDS or DMD program.

While most (93%, n=80) of the respondents indicated that research is taught in the dental hygiene curriculum, the majority (59%, n=43) did not offer research as a stand-alone course (Table 4). Among the institutions that did not include a stand-alone research course, the topic was most often incorporated into community courses (50%, n=38). A small percentage incorporated research into ethics courses (12%, n=9) and statistics courses (8%, n=6). Thirty percent (n=23) of the institutions not offering a stand-alone research course indicated that it was taught in a course not listed in the survey question. These course categories encompassed preventative dentistry, periodontology, seminar, and clinical dental hygiene. Some respondents indicated that research was taught in more than one of the aforementioned categories.

Research methods and design and EBDM (both 95%, n=76) were the two most common research topics taught among the respondents. These were followed by research interpretation (85%, n=68), statistics (80%, n=64), research ethics (76%, n=61), and use of human subjects and laws (65%, n=52). Less common topics included product approval (50%, n=40), procedure approval (41%, n=33), and use of animal subjects and laws (26%, n=21).

Regarding ethics, 87% (n=73) of responding institutions taught the Standards of Responsibility to Scientific Investigation in the Dental Hygiene Code of Ethics. Associate degree only programs were most likely to include this in the curriculum, representing
51% (n=43) of responding institutions, followed by baccalaureate degree only programs (19%, n=14). Associate and baccalaureate programs (10%, n=8) and baccalaureate and graduate programs (7%, n=6) ensued. In addition, 80% (n=66) of respondents taught ethics related to the use of human subjects and 34% (n=27) taught ethics related to the use of animal subjects.

The majority of responding institutions did not have faculty (55%, n=47) or students (65%, n=56) conducting original research. In the programs that had faculty and students conducting research, human subjects were most often used in faculty and student research over the past ten years (77%, n=30 and 73%, n=22 respectively), while 31% (n=12) of faculty research and 43% (n=13) of student research was reported as not using human or animal subjects.

Among the associate degree programs that had students conducting research, (n=12), 75% (n=9) required students to conduct original research. Among the baccalaureate degree respondents that had students conducting research (n=7), 71% (n=5) required students to conduct original research. Among the graduate degree respondents that have students conducting research (n=2), 100% (n=2) required students to conduct original research (Table 5, Figure 1). It is important to note that percentages are based on response rates in this survey and they were not representative of the total number of respective dental hygiene programs. Thus, the percentage of associate degree respondents requiring students to conduct research appears higher due to the greater number of associate degree programs responding to the survey.
Seven percent (n=6) of respondents indicated that research is not taught in the dental hygiene program. Of the six schools that did not teach research, 83% (n=5) were associate degree programs and 17% (n=1) indicated they had a school with both associate and baccalaureate degree programs (Table 6). Forty-six percent (n=36) of responding institutions offered research as a stand-alone course. Institutions that contained baccalaureate programs comprised 72% (n=26) of that total, followed by institutions that had only an associate program (27%, n=10).

Baccalaureate programs (33%, n=13) had the highest rate of faculty producing original research. Associate degree programs (40%, n=12) reported the highest rate of students conducting research, followed by baccalaureate programs (23%, n=7) and baccalaureate and graduate degree programs (20%, n=6).

Among responding institutions with a DDS or DMD program (n=12), 92% (n=11) had faculty conducting original research and 42% (n=5) had students conducting original research. This is in contrast to institutions without a DDS or DMD program (n=67), where 27% (n=18) had faculty conducting original research and 30% (n=21) had students conducting original research (Figure 2).

Fisher’s exact test was used to compare: highest degree offered and whether or not research was taught; highest degree offered and stand-alone or combined research course (Table 7); faculty research and the existence of a DDS or DMD program (Table 8); and student research and the existence of a DDS or DMD program (Table 9). Statistical significance was found when comparing highest degree offered and stand-alone research course or a research course combined into another course, with a p-value
of <0.0001. A combined research course is most likely to occur in an associate degree program. Statistical significance was also found when comparing faculty research and the existence of a DDS or DMD program, with a p-value of 0.0001. Faculty were more likely to perform research when the dental hygiene program was housed with a DDS or DMD program.

Discussion

The ADHA affirms that research is critical to advancing the profession of dental hygiene, as well as expanding access to care and improving both public and private policies.\textsuperscript{15} The knowledge of progressive clinical techniques and treatment modalities, which is acquired through research, is also vital.\textsuperscript{15} The National Dental Hygiene Research Agenda identifies five priority research areas: Health Promotion/Disease Prevention, Health Services Research, Professional Education and Development, Clinical Dental Hygiene Care, and Occupational Health and Safety.\textsuperscript{15}

Beistle and Palmer asserted that dental curricula change and education reform is necessary.\textsuperscript{5} However, that transition is challenging and slow. Chichester et al. revealed that 62% of baccalaureate programs offered research as a stand-alone course and 14% of non-baccalaureate programs offered research as a stand-alone course.\textsuperscript{12} The survey for that study took place over 15 years ago, yet the results paralleled this study. In this study, 72% of baccalaureate programs offered research as a stand-alone course and 13% of associate programs offered research as a stand-alone course.\textsuperscript{12} The survey implemented
by Chichester et al., however, generated a 71% response rate. This is significantly higher than the response rate for this study (27%).

Although most (93%, n=80) of the respondents in this study indicated that research is taught in the dental hygiene curriculum, the majority of responding institutions did not have faculty (55%, n=47) or students (65%, n=56) conducting original research. If faculty and students are not conducting research in their respective programs, it may be difficult for research to become a priority in the curriculum of dental hygiene programs. However, CODA specifically requires that graduates be competent in the application of the principles of ethical reasoning, ethical decision making, and professional responsibility as they pertain to research. They must also be competent in the evaluation of current scientific literature and problem solving strategies. Therefore, research must remain a priority in dental hygiene curricula.

It has yet to be determined whether research concepts are more adequately taught in a stand-alone research course or in a combined research course. Thus, models for integrating research into curricula should be considered. Peachey and Baller discussed the utilization of team-based learning (TBL) and small group work to complete a research study within one semester in allied health research courses. This approach proved to be beneficial for several reasons: it incited critical thinking; students collaboratively utilized problem solving skills; the upper levels of Bloom’s taxonomy were applied; and students gained understanding of the literature.16

Moreover, Woolf examined problem-based learning (PBL) and inquiry-based learning (IBL) as techniques to integrate research into non-research methods courses.
These are active learning techniques, in which instructors act as facilitators. These approaches promoted critical thinking and enabled students to properly interpret evidence.

Furthermore, possible explanations for the response rate of this study are of interest. The response rate of this study was slanted towards baccalaureate programs and was not representative of the population as a whole. The substantial amount of baccalaureate responses may be related to the program directors’ interest and/or value in research. In this study, baccalaureate programs had the highest rate of faculty producing original research. In the case of faculty conducting original research, program directors may have an increased interest and/or value in research.

Future research is needed in regards to the integration of research into U.S. dental hygiene programs. The efficacy of teaching research in a stand-alone course versus in a combined course should be assessed. Future research in faculty interests and values on research is also necessary, as well as instructional techniques. Once these factors have been evaluated, national leaders can determine proper curricular changes to ensure the adequate integration of research into dental hygiene curricula.

Limitations

A significant limitation to this study was that it was assumed that questions were about entry-level dental hygiene programs. This was not clearly defined on the survey. The responding institutions with graduate programs may have answered based on the
graduate programs, therefore skewing the data. Another limitation to this study was that “original research” was not defined and could have been interpreted in various ways by the program directors, affecting their responses.

**Conclusion**

The results of this descriptive study suggest that research is taught at associate, baccalaureate, and graduate levels of dental hygiene education. The capacity to which research was taught widely varied among the respondents. The majority of responding institutions did not offer research as a stand-alone course and most of the programs did not have faculty or students conducting original research. This may indicate that students are taught only certain facets of the concept of research, predominantly evidence-based decision making (EBDM) and research methods and design. This study, along with previous research, indicates that the integration of research into dental hygiene curricula requires further review.\(^3,4,5\)
References


Appendix A: Letter to Dental Hygiene Program Directors

Dear Program Director,

You are invited to participate in a survey regarding research in your dental hygiene curriculum. The purpose of this study is to investigate the integration of research into dental hygiene curriculums.

Your participation is completely voluntary. You may decline altogether or leave blank any questions you do not wish to answer. If at any point you do not wish to continue, you may choose to stop answering the questionnaire. There is no compensation for your participation, nor are there any known risks to participating. Your responses will remain confidential. By continuing with the survey, you are consenting to participate. It should take approximately 10 minutes to complete. This study has been determined to be exempt.

Your time and participation are greatly valued. If you have questions regarding this survey, please contact Danielle Nuss (nuss.23@osu.edu).

The link for the survey is highlighted below.

Follow this link to the Survey:
Take the Survey

Or copy and paste the URL below into your internet browser:
https://osu.az1.qualtrics.com/SE/?Q_DL=7a3KywZMEtP9gAB_dojdRH522uJcfch_MLRP_b1M8QWWWeSZ0Osl&Q_CHL=email

Follow the link to opt out of future emails:
Click here to unsubscribe

Thank you,
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Appendix B: Survey

1. What dental hygiene degrees does your program award? (Choose all that apply)
   a. Certificate/Diploma
   b. Associate Degree
   c. Baccalaureate Degree
   d. Master Degree
   e. Doctoral Degree

2. Which best describes the type of institution that houses your dental hygiene program?
   a. Community College
   b. 4-year College or University
   c. Other

3. Does your College/University have a DDS or DMD program?
   a. Yes
   b. No

4. Is research taught in your curriculum?
   a. Yes
   b. No
5. Is research taught as a stand-alone course?
   a. Yes
   b. No

6. If no, in which of the following courses is research taught?
   a. Community
   b. Ethics
   c. Statistics
   d. Other

7. What dental research topics are taught in your curriculum? (Check all that apply)
   a. Research methods and design
   b. Use of human subjects and laws
   c. Use of animal subjects and laws
   d. Product approval (how new products are approved)
   e. Procedure approval (how new procedures are approved)
   f. Statistics
   g. Research interpretation
   h. Research ethics
   i. Evidence-based decision making
   j. Other

8. Is the Dental Hygiene Code of Ethics taught; specifically, Standards of Responsibility to Scientific Investigation?
   a. Yes
b. No
9. Are ethics related to the use of human subjects taught in your curriculum?
   a. Yes
   b. No
10. Are ethics related to the use of animal subjects taught in your curriculum?
    a. Yes
    b. No
11. Do faculty in your program conduct original research?
    a. Yes
    b. No
12. Research is conducted or has been conducted on the following by faculty in our department within the past 10 years. (Choose all that apply)
    a. Human subjects
    b. Animal subjects
    c. Neither human subjects nor animal subjects
13. If your faculty conduct research on animal subjects, please indicate which animals. (Choose all that apply)
    a. Mice
    b. Rats
    c. Guinea Pigs
    d. Pigs
    e. Rabbits
f. Dogs  
g. Cats  
h. Other  

14. Do students conduct original research while in your program?  
a. Yes  
b. No  

15. Conducts research  
a. Associate degree students  
b. Baccalaureate degree students  
c. Graduate students  

16. Required  
a. Associate degree students  
b. Baccalaureate degree students  
c. Graduate students  

17. Research is conducted or has been conducted on the following by students in our department within the past 10 years. (Choose all that apply)  
a. Human subjects  
b. Animal subjects  
c. Neither human subjects nor animal subjects  

18. If your faculty conduct research on animal subjects, please indicate which animals. (Choose all that apply)  
a. Mice
b. Rats

c. Guinea Pigs

d. Pigs

e. Rabbits

f. Dogs

g. Cats

h. Other
### Appendix C: List of Tables

Table 1. Responding Degree Programs in Relation to the Total Population

<table>
<thead>
<tr>
<th>Degree Program</th>
<th>Total Survey Respondents</th>
<th>Total in the U.S.</th>
<th>Percent of Respondents out of Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Degree</td>
<td>61</td>
<td>288</td>
<td>21%</td>
</tr>
<tr>
<td>Baccalaureate Degree</td>
<td>34</td>
<td>56</td>
<td>61%</td>
</tr>
</tbody>
</table>
Table 2. Demographics of Respondents: Degree Awarded (n=86)

<table>
<thead>
<tr>
<th>Degree Awarded</th>
<th>Associate Degree</th>
<th>Baccalaureate Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Respondents</td>
<td>71% (n=61)</td>
<td>40% (n=34)</td>
</tr>
</tbody>
</table>

*Some institutions offer multiple degree programs.*
Table 3. Demographics of Respondents: Type of Institution (n=86)

<table>
<thead>
<tr>
<th>Type of Institution</th>
<th>Community College</th>
<th>4-Year College or University</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td># of Respondents</td>
<td>52% (n=45)</td>
<td>38% (n=33)</td>
<td>9% (n=8)</td>
</tr>
</tbody>
</table>
Table 4. Demographics of Respondents (n=86)

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDS/DMD Program?</td>
<td>15% (n=12)</td>
<td>85% (n=67)</td>
</tr>
<tr>
<td>Research Taught?</td>
<td>93% (n=80)</td>
<td>7% (n=6)</td>
</tr>
<tr>
<td>Stand-Alone Research Course?</td>
<td>41% (n=30)</td>
<td>59% (n=43)</td>
</tr>
</tbody>
</table>
Table 5. Student Research *Required* in Programs Conducting Research Associated with Degree Awarded

<table>
<thead>
<tr>
<th>Degree Awarded</th>
<th>Research Required</th>
<th>Research Not Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate</td>
<td>75% (n=9)</td>
<td>25% (n=3)</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>71% (n=5)</td>
<td>29% (n=2)</td>
</tr>
<tr>
<td>Graduate</td>
<td>100% (n=2)</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 6. Degree Awarded Associated with Research Taught (p=0.6595)

<table>
<thead>
<tr>
<th>Degree Awarded</th>
<th>Research Taught</th>
<th>Research Not Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate</td>
<td>90% (n=47)</td>
<td>10% (n=5)</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>96% (n=27)</td>
<td>4% (n=1)</td>
</tr>
</tbody>
</table>
Table 7. Degree Awarded Associated with Type of Research Course (p=<0.0001)

<table>
<thead>
<tr>
<th>Degree Awarded</th>
<th>Stand Alone</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate</td>
<td>22% (n=10)</td>
<td>78% (n=36)</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>74% (n=20)</td>
<td>26% (n=7)</td>
</tr>
<tr>
<td></td>
<td>Faculty Research</td>
<td>No Faculty Research</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>DDS/DMD Program</td>
<td>92% (n=11)</td>
<td>8% (n=1)</td>
</tr>
<tr>
<td>No DDS/DMD Program</td>
<td>31% (n=21)</td>
<td>69% (n=46)</td>
</tr>
</tbody>
</table>

Table 8. Faculty Research Associated with DDS/DMD Program (p=0.0001)
Table 9. Student Research Associated with DDS/DMD Program (p=0.3165)

<table>
<thead>
<tr>
<th></th>
<th>Student Research</th>
<th>No Student Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDS/DMD Program</td>
<td>42% (n=5)</td>
<td>58% (n=7)</td>
</tr>
<tr>
<td>No DDS/DMD Program</td>
<td>27% (n=18)</td>
<td>73% (n=49)</td>
</tr>
</tbody>
</table>
Appendix D: List of Figures

Figure 1. Percentage of Responding Institutions Requiring Students to Conduct Original Research
Figure 2. Faculty and Student Original Research Conducted at Programs with and without a DDS/DMD Program