Exploration of Critical Thinking in Dental Hygiene Education

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Introduction

Twenty-first century health care is dynamic and challenging. On a daily basis, health care professionals make decisions which require calculated and structured thought, incorporating the use of critical thinking skills.[1-3] As health care evolves to include even more complex patient treatment options, increased pharmaceuticals and a diverse population, so should the manner in which professionals are taught in educational programs. Indeed, the Institute of Medicine has concluded that all health care professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing evidence based practice utilizing critical thinking skills, quality improvement approaches, and information.[2]

Historically, educational programs for health professionals, including the dental profession, have taught students by lecture and rote memorization with the goal to pass the national and state licensure exams.[4-6] As indicated by numerous researchers in dental education, dental programs often have overcrowded curricula which are locked into a specific time frame, contain redundant or marginally useful information, and do not allow for unique educational experiences to develop critical thinking skills.[4-11] Dental education reform and curricular change has been needed to educate students using the best teaching methods currently available. This has led to the rethinking of practices in post-secondary preparation programs for dental hygiene, along with a number of other professional preparation programs in health and dental care.[5,12]

Abundant literature also substantiates the need for inclusion of critical thinking skills in educa-

Abstract

Purpose: This qualitative study explores the perceptions of dental hygiene faculty regarding issues surrounding critical thinking skills integration within their associate degree dental hygiene programs.

Methods: Twenty faculty participated in the study, as drawn from 11 accredited associate degree dental hygiene programs in one Midwest state. Multiple sources of data were collected, including email questionnaires, individual follow-up phone interviews and artifacts. Interpretive analysis was conducted.

Results: Data analysis revealed that faculty generally understood critical thinking, but interpretations varied. Most do not use varied teaching strategies to promote critical thinking skills, and focus on one particular strategy – that of case studies. The participants identified the need for allied health-focused faculty development opportunities, and noted that calibration of instruction was needed. Despite challenges, faculty felt responsible for teaching critical thinking skills, and identified the need for time to build critical thinking skills into the curriculum.

Conclusion: This study was conducted in response to the American Dental Education Association Commission on Change and Innovation's challenge for dental hygiene educators to comprehend their own knowledge on the concept of critical thinking related to research-based pedagogical approaches to teaching and learning. Findings revealed a strong desire among the dental hygiene faculty in this study to incorporate critical thinking into their work. They want to do what they believe is the right thing, but their actual knowledge of the definitional and application theories about critical thinking is still in the early stages of development. Regular and targeted faculty development opportunities are needed.

Keywords: critical thinking, curriculum, teaching strategies, dental hygiene

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tion.[13-21] In addition, allied health programs, such as dental hygiene education, must provide evidence of meeting accreditation standards which indicate graduates are competent in the use of critical thinking and problem-solving skills related to comprehensive care of patients.[22-24]

Specifically, if the preservation of dentistry as a learned profession with sustainable vitality in education and research is to continue, there is a call

for serious curricular change and innovation in both the classroom and clinical setting for dental education.[6,10,12] Dental education commissions, such as the Commission on Dental Accreditation, the American Dental Association Council on Dental Education and Licensure and the Joint Commission on National Dental Examiners, have unanimously recognized the need to change dental curricula as a part of improving the nation's oral health.[22] The American Dental Education Association Commission on Change and Innovation suggests that changing science, technology, and disease patterns will transform oral health care delivery greatly impacting all disciplines of oral health education.[23] This, in turn, creates both a set of implications and a sense of urgency for rethinking dental education.

While it is generally agreed that instruction in dental hygiene programs must incorporate critical thinking and decision making skills, there is an absence of research on the cognitive components of clinical decision making, which includes concepts of critical thinking.[7,8,10,24] As a result, it is difficult to chart a course for such change in dental hygiene programs without examining the current status of faculty regarding their understanding and practice of teaching critical thinking skills in their discipline.

Therefore, the goal of this research was to examine dental hygiene faculty perceptions and thinking surrounding critical thinking issues within their accredited associate degree dental hygiene programs. The focus was on faculty who teach or have taught first and/or second year clinical theory courses within their dental hygiene program. For the purposes of this study, critical thinking is defined as an art of analyzing and evaluating thinking by self-discipline, self-correction and self-monitoring within a framework to improve one's thinking.[25,26]

The work of Paul and Elder was chosen as a lens for the study.[26-30] In alignment with other theorists and researchers,[13,14,18] Paul and Elder believe that within the critical thinking process there are 3 levels of critical thinking, and methodical practice is needed for a person to move from the lowest level to the highest level. These authors have also identified effective teaching activities and practices that offer opportunities for deeper learning which are based upon the use of their critical thinking model. Their model has been used by various higher education institutions and their ideas promoted through various faculty development centers, including those within the state where this study was conducted.[31-33] In addition, Cosgrove et al developed an "international critical thinking basic concepts and understanding test" which has been demonstrated to have a high degree of consequential va-

lidity.[34] Their white paper titled "Consequential Validity: Using Assessment to Drive Instruction" goes into further detail supporting this critical thinking skills test.[35] It was therefore appropriate to use their work for the study of dental hygiene faculty in this state, while the work of other critical thinking experts may serve as the lens for similar studies in other states.

Specifically, this study pursued the following research questions:

1. How do dental hygiene faculty define the concept of "critical thinking" (as viewed through the lens of Paul and Elder's work), and the process of becoming a critical thinker within the field of dental hygiene (including when and how they learned about the concept of critical thinking)?
2. How do these faculty describe their personal and departmental rationale and decision regarding the integration of critical thinking skills into their curriculum?
3. How do they describe their strategies and processes for teaching critical thinking skills in their discipline?
4. What challenges do they experience as they address new curriculum standards for integrating critical thinking in the classroom or clinic?

Methods and Materials

A qualitative study approach is often used to examine the social and cultural aspects of a particular program, group or organization, and thus was used in this study to assess the perceptions of dental hygiene faculty regarding various critical thinking issues.[36]

The selection criteria was all faculty members who have taught and/or teach first and second year clinical theory courses within each of the 11 accredited associate degree dental hygiene programs in one Midwestern state. The theory courses are those that focus on clinical theory as applied to clinical procedures, and were chosen because they focus on helping students learn to think critically and with substance when treating a patient, including assessment, diagnosis, planning, implementation and evaluation. These courses also cover similar content across the 11 programs in this state as part of preparation for the North East Regional Board Exam, the clinical exam for this state and the National Board Dental Hygiene Exam.

This population of faculty was purposefully chosen, both because of their particular knowledge of the phenomenon being studied, and because the researchers had a connection with this state's den-

tal hygiene educator's association, making it more likely that faculty would be willing to participate in this study.[37] Initially, 26 faculty members were identified who met the selection criterion, and received an email invitation to participate. Three had left their institution or no longer taught those courses. Of the 23 remaining faculty members in the target population, 20 (87%), with at least 1 from each of the 11 programs in the state, offered their assent to participate (following the protocol approved by a Human Subjects Institutional Review Board).

To support triangulation of the data, 3 types of data were collected for this study.[38] First, open-ended questions were created and piloted tested with 2 dental hygiene colleagues to enhance face validity. These 2 colleagues were out of state and have embraced the concepts of Paul and Elder through various faculty development workshops. After appropriate revisions, the questions were sent by email to participants to elicit their understanding of what critical thinking is, and the strategies or methods used to teach students to think critically. The researchers choose this approach because it allowed time for participants to reflect upon the questions and craft their response by email.

A second data set was obtained via follow-up phone interviews, with specific interview questions developed for participants to probe beyond their initial email responses. These interview questions were also pilot tested and revised prior to usage. Each phone interview was approximately 20 to 40 minutes in length, and was recorded for later transcription.

A third data set involved a review of artifacts collected from participants which demonstrated their integration of critical thinking, such as class activities, syllabi, scoring rubrics and program web pages. These items were reviewed to see if they provided concrete evidence to back up (or not) what participants had indicated they were doing in relation to the topic of critical thinking.

The phone interview responses were transcribed, and the process of interpretative qualitative analysis began. The researchers first analyzed the verbatim transcripts and responses to narrative questionnaires, identifying themes related to understanding the concept of critical thinking. An initial list of commonalities was created, and then refined by sorting each commonality into similar categories and subcategories. This was followed by the identification of common themes until an emergence of repeating premises or regularities resulted.[36-38] Through this process, the researchers were able to eliminate redundancies and create a list of themes that emerged from analysis of the data related to the research questions.

The integrity of the research methods was enhanced by utilizing several approaches suggested by Creswell.[38] The email questions, as well as the follow-up interview questions, were piloted with 2 dental hygiene colleagues prior to their usage, and revisions were made to enhance the face validity of these tools.[37] Member-checking was used whereby each participant was allowed to review the narrative constructed from their interview and offered clarifications as needed.

Limitations

It is important to note that this research study had a specific targeted population and therefore cannot be generalized to populations beyond the faculty within these 11 accredited associate degree dental hygiene programs in one Midwest state.[36-38] However, while the findings cannot be generalized, they may be of informational interest to other dental hygiene programs that are working to include critical thinking skills within their programs.

In addition, the primary researcher chose to use the work of Paul and Elder as a framework for this study, while the work of other critical thinking experts may serve as the lens for similar studies in other states.[26-30]

Results

Participants included 19 females and 1 male, ranging in age from 30 to 60 years old. Years of teaching experience ranged from one to 25 years. Two participants held doctoral degrees, 12 held masters and 6 had baccalaureate degrees. It should be noted that participant demographics were collected as a means to describe the population in the study, not to look for differences within this qualitative study.

Analysis of data revealed themes which were subsequently grouped under the core research question areas.

Research Question 1: Knowledge of the Concept of Critical Thinking

Research question 1 examined how dental hygiene faculty define the concept of "critical thinking" (based upon the framework of the concepts of critical thinking from Paul and Elder's work), and the process of someone becoming a critical thinker

within the field of dental hygiene (including when and how they learned about the concept of critical thinking).

Three themes emerged to address this research. First, most faculty members offer at best only a partial definition of the concept of critical thinking (theme 1.1). Only 5 of the 20 participants were able to give a complete and specific definition of critical thinking as defined by Paul and Elder.[26] Such responses included all essential elements such as clearly formulating vital questions and problems, assessing relevant information, determining well-reasoned conclusions and solutions, thinking open-mindedly with alternative systems of thought, and effectively communicating with others. For example, participant #8 (via the open-ended questionnaire) provided this complete definition of critical thinking, "Students critically think when they can assess information, define the problem, draw a conclusion, devise possible solutions, come up with a plan of action, and can evaluate whether their idea or plan worked." The other 15 participants offered only segmented critical thinking concepts.

The second theme which addressed this research questions was that most participants initially learned about the concept of critical thinking in a formal manner (theme 1.2). Eighteen of the 20 participants indicated they learned about the concept of critical thinking through different forms of educational opportunities, with 12 of these 18 first learning about the concept of critical thinking skills through some sort of faculty development opportunity. Several noted that they had initially learned about the concept as part of their own formal training as a student dental hygienist or dental student in the classroom.

The third theme for this research questions was that all participants indicated they learned how to teach critical thinking skills through various faculty development opportunities (theme 1.3). All 20 participants learned how to teach what they believe to be critical thinking skills during faculty development workshops and seminars. Thirteen reported such workshops were offered by their own educational institutions, while the other 7 attended training at other institutions.

Research Question 2: Decisions to Teach Critical Thinking Skills

Research question 2 examined how dental hygiene faculty describe their personal and departmental rationale, and their decisions regarding the integration of critical thinking skills into their curriculum. Two themes emerged to address this ques-

tion. The first theme was that the majority agreed as a faculty group to include the teaching of critical thinking skills into their programs (theme 2.1). Thirteen of the 20 participants indicated they agreed as a faculty group to implement the teaching of critical thinking skills into their curriculum. For example, participant #3 (via the open-ended questionnaire) shared this response, "program faculty (full time) decided together how to implement critical thinking skills into the curriculum. This is something that has evolved over time for us." The other 7 participants indicated they decided on their own to teach critical thinking skills in the curriculum.

The second theme for research question 2 was that a majority of faculty expressed limited resistance to changing their curriculum to include the teaching of critical thinking skills (theme 2.2). Fourteen of the 20 participants expressed no major resistance to the changes needed as they incorporated the teaching of critical thinking skills into their coursework. Most participants embraced the teaching of critical thinking skills, indicating that teaching critical thinking skills is a must for health care providers. For example, participant #2 (via the follow-up phone interview) shared this statement, "I love teaching this way. It allows and encourages students to share their personal experiences, what has worked and what has not. It incorporates all of their personal experiences to be applied and utilized as health care providers."

The other 6 participants expressed frustration and or felt resistance from their students to engage in classroom teaching strategies that included using critical thinking skills. For example, participant #18 (via the open-ended questionnaire) shared her frustration: "With increasing demands on instructors for quality assurance, the necessary steps to provide a quality accredited program, there seems to be less and less time to perfect the pedagogical skills involved in the goal of actually teaching critical thinking skills!"

Research Question 3: Teaching Strategies Using Critical Thinking Skills

The third research question examined how faculty described their strategies and processes for teaching critical thinking skills in their discipline. Three themes emerged. The first theme was that many faculty described using research-based teaching approaches to help students learn critical thinking skills (theme 3.1). Fifteen of the 20 participants indicated they are using several specific strategies to teach critical thinking skills, including: self-assessment, concept mapping, case studies, Socratic questioning and substantive writing. Some

participants indicated that case studies were used most often.

The other 5 participants provided responses of other teaching strategies not identified by Paul and Elder as the most effective ways to teach students critical thinking skills (e.g., lecture, group work; question and answer).[26] For example, participant #8 (via the open-ended questionnaire) shares this content, "In my Theory course, I lecture to students, and ask them their opinions or ideas, rather than just asking for "the right answer.""

The second theme which addressed research question 3 was that all participants expressed they felt responsible to teach critical thinking skills in order to prepare students for the work world (theme 3.2). All 20 participants believed they have a duty to teach students critical thinking skills, helping them to engage in real world experiences. For example, participant #20 (via the follow-up phone interview) noted, "The primary responsibility lies with the individual instructors to integrate critical thinking into the various courses that they teach. As a faculty we are always working on ways to bring critical thinking skills into the clinical environment modeling the real work world." In congruence, participant #9 (via the open-ended questionnaire) noted: "Critical thinking is purposefully installed within courses by individual faculty. Critical thinking skills are something that must be implemented within our curriculum as often as is possible."

The third theme for this research question was that the majority of participants reported that second year students are given more autonomy, and as a result teaching strategies used to teach critical thinking skills become more complex (theme 3.3). Twelve of the 20 participants identified students having more autonomy as they progress through the last semester of the curriculum, and teaching strategies used to teach critical thinking skills become more complex. For example, participant #6 (via the open-ended questionnaire) noted: "Methods taught to first year students are self-corrective, and self-disciplined. Methods taught to second year are how to increase knowledge, skill assessment, and evaluate continuing care to patient case types." The other 8 participants were not consistent with their responses when questioned about the complexity of teaching strategies as students progressed through the curriculum.

Research Question 4: Challenges with Today's Students Teaching Critical Thinking Skills

The fourth research question focused on the challenges faculty experienced as they addressed new curriculum standards for integrating critical thinking in the classroom or clinic. Two themes appeared: the first theme is that many reported their students simply have a "tell me what I need to know" approach rather than a desire to learn how to learn to think critically (theme 4.1). Thirteen of the 20 participants believe most students want to be taught what they need to know to pass the boards and not how to learn to think critically. For example, participant #10 (via the open-ended questionnaire) wrote: "The challenge is that students want faculty to spoon-feed them everything and tell them the answers because that may have been how they learned and were taught in the pre-dental hygiene courses."

The second theme which addresses this research question is that many participants' indicated there should be more calibration of instruction when teaching critical thinking skills in didactic and clinical settings (theme 4.2). As one major challenge, 11 of the 20 participants agreed that more work is needed to truly integrate critical thinking skills both in the classroom and the clinic. As the participants responded, it was almost as if this was a self-realization as to what steps the participant and/or the program was taking in regards to the cohesive teaching of critical thinking skills.

Other participants shared broad categories of challenges they face when teaching critical thinking skills within dental hygiene programs. Some shared the fact that time, reduction of credit hours per program, and awareness of students' different styles of learning creates the need for congruency among faculty teaching in the program.

Overall, on varying levels, all participants mentioned the difficulty of preparing students to critically think as required for such a demanding health care profession. As noted earlier, participants voiced the need for more time to teach the required dental hygiene course content utilizing teaching strategies incorporating critical thinking skill, especially as they strive to ensure that students actually learn the content by critically thinking.

Discussion

The overall goal was to understand dental hygiene faculty perceptions and understanding of critical thinking issues. After reviewing the themes found in this study, 8 major findings were identified. These findings are only applicable to the population involved in this study and while the framework for this research was based upon a single theory, it should be noted that there are more theoretical models researchers could explore.

First, the dental hygiene faculty in our study generally understood the concept of critical thinking, but interpretations varied, and not all could offer a complete definition. This finding is similar to work by who found most general education faculty believe they knew what critical thinking is, but could not give a concrete understanding of the concept.[25] Indeed, over 75% of the faculty were unable to adequately define the constructs underlying critical thinking.

Second, dissimilar to aspects of previous research by Paul and Elder,[26] Williams et al,[39] Giddens and Gloeckner,[40] and Hessheimer et al[41] which reveals multiple researched-based teaching strategies to promote critical thinking skills, most of our participants primarily focused on one particular teaching strategy throughout the curriculum - that of case studies. Faculty did note the importance of other research-based teaching strategies, but cited case studies as the most important. This reveals a serious disconnect between the theories of how critical thinking should be taught (i.e., with case studies being just one of many strategies), and what was actually happening in the field with the faculty in this study (and perhaps what is happening elsewhere as well).

Third, adding to the previous research of Asadoorian et al,[5] Hessheimer et al,[41] and Kassebaum et al,[42] which found that faculty development opportunities on the instruction of critical thinking are essential, our participants identified the need for specific allied health-focused faculty development opportunities. The shift to teaching critical thinking skills requires a commitment from organizations to help faculty understand what critical thinking is, and identify what educational strategies can be used to effectively teach critical thinking and assess changes in students' critical thinking skills. Organizations must offer continuous allied health-focused faculty development opportunities, and venues to discuss, implement and examine the scholarship of teaching.

Fourth, while participants believed all faculty were teaching the concept of critical thinking, they expressed concerns of not knowing specifically what others were doing, or how well things were working. The need for faculty time, to share their experiences and assess what methods are really helping the students to learn critical thinking skills, was very apparent. Participant recommendations were that calibration of instruction was needed so that all faculty can make the necessary changes in an effective way, and allow them to focus on effective teaching strategies. No similar finding could be found in previous research.

Fifth, adding to the previous work of Doyle, Tagg and Weimer, who identified a paradigm shift in teaching, the participants in this study identified challenges with teaching today's students.[14,19,21,43] Faculty found resistance from students who did not want to engage in the teaching strategies to promote critical thinking, and some students just wanted "to be spoon fed in order to know what was going to be on the boards."

Sixth, supporting the previous findings of Barlett, Ellerman, and Paul and Elder, which revealed that intellectual traits must be taught in health curricula moving from the novice to the expert thinker, the participants agreed that coursework intensifies throughout the curriculum and so should the students' ability to think critically.[25-29,44,45] Faculty identify that first year students are learning large amounts of foundational content, and that students become more autonomous as they move through the second year of the curriculum.

Seventh, participants in this study felt responsible for teaching critical thinking skills to students as part of workforce preparation. Many acknowledge that a health professional must be able to think critically during patient clinical treatment. Clinical dental hygiene practice demands critical thinking and as such faculty are attempting to include critical thinking activities daily in their teaching practices. In addition, faculty recognized that critical thinking skills had been taught to them during their own experiences as students in dental hygiene school, and felt responsible to now teach critical thinking skills to others. Faculty reminisced that they remembered hearing and learning about critical thinking while being a student in their undergraduate dental hygiene program, and have been fortunate to receive institutional support to now learn how to teach critical thinking skills themselves. Boud et al[46] and Mezirow[47] would have indicated that these faculty are engaging in the reflective process from their own student experiences in the clinical setting, connecting it to prior theoretical knowledge in order to improve future clinical practice, and ultimately, learning from one's own experience.

Lastly, participants identified a lack of time to adequately teach critical thinking skills in the curriculum. Research indicates it takes time to develop increased levels of critical thinking and students must progress through the various levels.[25] Paul and Elder also indicate faculty must be willing to move students through the various levels of thinking utilizing research-based teaching strategies employing critical thinking skills.[26-30] While our participants expressed willingness to engage in such

activities, and had an understanding of how such skills become more complex over time, they identified time as a constraint when trying to incorporate critical thinking skills into their coursework.

Conclusion

The findings of this study serve as one response to the American Dental Education Association Commission on Change and Innovation's challenge for dental hygiene educators to expand their research-based pedagogical approaches to teaching and learning with a particular emphasis on the concept of critical thinking.[11] This research provides an interpretation of how dental hygiene faculty in one Midwest state define and understand the concept of critical thinking within their dental hygiene program.

While a qualitative study focusing on the dental hygiene programs within a single state cannot be generalized to all dental hygiene programs, this study revealed a very strong desire among these faculty to incorporate critical thinking into their work. They want to do what they believe is the right thing, but their actual knowledge of the definitional and application theories about critical thinking is still in the early stages of development. It is important for the profession to ascertain if other faculty across the country are also in a similar position, and if so, energy should be expended via targeted faculty development to help move the profession toward their ultimate goal – having well trained health professionals using critical thinking skills in their daily practices.

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