

Student Self-Assessment in Dental Hygiene Education: A Cornerstone of Critical Thinking and Problem-Solving

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Abstract: Self-assessment is an integral component of learning and developing decision making and critical thinking skills in the practice of dental hygiene. Dental hygienists must think critically and develop problem-solving strategies during their formal education to ensure lifelong quality and ongoing development of their personal knowledge and skill as related to providing comprehensive, evidence-based patient care. The primary focus of this qualitative investigation was to obtain undergraduate dental hygiene students' perceptions of and experiences with self-assessment. The sample consisted of an intact undergraduate dental hygiene class of seventeen students in their final semester of a two-year, entry-level dental hygiene program at a community college in the southeast United States. Data for this research were obtained from three sources: 1) a program-designed self-assessment survey assignment, 2) in-depth interviews with four second-year dental hygiene students, and 3) program-designed clinical competence evaluation forms. Inductive data analysis revealed that the majority of students perceived that they had no prior experience with self-assessment in any prerequisite coursework and thus felt unprepared for its use in the dental hygiene program. As they matriculated in the program, students began to see the advantages of self-assessment in clinical practice. Programmatic orientation to self-assessment may therefore be beneficial due to the varying backgrounds of students entering dental hygiene programs.

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Upon graduation, dental hygienists become direct providers of patient care, and instructors are no longer available to provide evaluation and guidance. Learning to evaluate one's own skills and demonstrating competence in self-assessment are therefore considered necessary for entry into the dental hygiene profession. Effective self-assessment is based on the ability to deconstruct an event and make a judgment about it based on an individual's understanding of the situation. At the same time, the individual must reflect on his or her understanding of the situation and evaluate how to respond. The ability to accurately self-assess is a cornerstone for developing strong critical thinking and problem-solving skills.¹⁻⁵

It should not be assumed that, upon entry into a professional program, students will possess knowledge of the self-assessment process needed to think critically and make sound decisions without assistance. The process of learning through developing experiences requires instruction beyond the presentation of defined bodies of knowledge. Growth, especially in adult learning, involves both the assimilation and application of knowledge. Students must be encouraged to develop and apply knowledge as part of a decision making process.⁶ To help educators better understand how to help their students develop this ability, the primary focus of this qualitative investigation was to acquire and assess a group of undergraduate dental hygiene students' perceptions of and experiences with self-assessment.

Self-Assessment in the Dental Professions

In 2009, the American Dental Education Association Commission on Change and Innovation in Dental Education (ADEA CCI) issued a collection of commissioned articles developed over a five-year period “to stimulate self-assessment and reflection on the status of academic dentistry and to consider ways to enhance the preparation of our next generation of practitioners.”⁷ These articles, originally published in the *Journal of Dental Education* from 2005 to 2009, were combined in a single volume entitled *Beyond the Crossroads: Change and Innovation in Dental Education*. These twenty-two articles were intended to encourage new ways of thinking about curriculum development, teaching and learning strategies, student assessment, educational leadership, and academic environment and quality of faculty work-life in the realm of dental education. Included in this national initiative to explore the future directions of dental education, the ADEA CCI has specifically addressed the role of fostering skills in self-assessment, critical thinking, and problem-solving in the development of lifelong learners capable of providing evidence-based oral health care.

The authors of one of these articles discuss critical components of what has been termed “the novice to expert learning continuum” and how it relates to the development of practitioners who exhibit critical thinking, problem-solving, and self-directed learning skills associated with lifelong learning.⁵ Application of this learning continuum to dental education has been well documented in the literature.^{5,8,9} According to this theory, learners progress through stages from the novice, or true beginner, to the final stage of expert: “An individual in training for a professional role evolves from a true neophyte . . . through a series of stages where capacities are gradually and progressively enhanced by trial and error learning and successive approximation supported by timely and corrective coaching” (p. 926).⁵ Dental and dental hygiene students graduate from their programs as entry-level practitioners midway across the continuum, at the stage identified as competent. While individuals at the competent stage are deemed to have the capacity to function independently without instructor supervision, their knowledge will continue to grow as lifelong learners moving toward the expert end of the continuum.⁵

Crucial to facilitating learning is recognizing that all students enter the learning continuum with varying degrees of cognitive ability. Much of the self-assessment literature in medicine and dentistry to date emphasizes measuring the accuracy of self-assessment and the challenges in doing so.¹⁰⁻¹⁴ However, it does not address what experience students have with self-assessment prior to entering their program. Some research has found that students often have difficulty transitioning from secondary education to a university or professional program.^{15,16} Occasionally, students may feel overwhelmed when asked to perform such tasks as self-assessment when they are expected to engage in accurate evaluation of themselves without adequate training during prerequisite coursework.^{15,16} Fundamental issues such as these must be addressed in dental hygiene education as a component of developing long-term competence in self-assessment and enhanced critical thinking and problem-solving.

Self-assessment involves the process of collecting information about and reflecting on one’s own performance. This is essential in the process of developing problem-solving and critical thinking abilities. Developing proficiency in critical thinking involves the use of metacognitive skills as well. Metacognition refers to self-awareness of one’s own thinking, or the ability to comprehend, analyze, and reflect one’s own knowledge and learning.¹⁷⁻²⁰

Self-assessment serves as a form of quality assurance. Quality assurance programs focus on the decision making process and on improving the overall quality of care provided by health care practitioners.^{1,2} Health care providers unable to accurately self-assess may be at risk of rendering less than optimal care for their patients.¹³

While much of the literature details the benefit of different aspects of self-assessment, questions have been raised concerning the consistency of how self-assessment is taught and evaluated in health care education, and current research continues to show variations regarding self-assessment training in medical and dental schools.^{10,13,21} Self-assessment research in dental hygiene has centered more on the attitudes and perceptions of practicing dental hygienists, rather than undergraduate students’ self-assessment in dental hygiene education and skill development.^{1,2,22}

Competence in self-assessment begins with training in the basic skills needed to develop and evaluate personal goals and abilities. Health professions education programs are accountable for

graduating competent clinicians. Thus, it is the responsibility of these institutions to teach students how to identify goals and progress toward achievement of those goals. Gordon's 1992 review of self-assessment literature from the 1970s through the early 1990s reported inconsistencies in the formal teaching of self-assessment skills within health professions education.²³ Gordon also found that programs that successfully implemented self-assessment as part of their curriculum reported improvements in students' communication, motivation, knowledge, and performance.

The Best Evidence Medical Education (BEME) Collaboration published an in-depth systematic review of self-assessment literature in 2007.²⁴ Its purpose was to determine the effectiveness of self-assessment in the identification of learner needs and its impact on clinical practice. The authors of that review found similar inconsistencies regarding teaching and evaluating self-assessment in clinical education to those reported by Gordon. The majority of studies included in the BEME report focused on the accuracy of self-assessment as compared with external assessment such as the judgment of faculty and peers or a criterion measure such as examinations or guidelines. None attempted to measure changes in perceptions of learning needs or reported on any self-assessment interventions that promoted individual learning. Despite this, evidence in the review did indicate that developing accurate self-assessment practice might be enhanced by identifying previous subject knowledge or skill, providing some level of instruction about a skill, and utilizing video or verbal feedback associated with execution of a skill.

The BEME review also explored the emerging philosophy of a need for more qualitative self-assessment research, noting that "self-assessment, no matter how it is defined, is a complex concept which does not lend itself to objective measurement."²⁴ The authors made a point that self-assessment for ongoing self-directed learning is a qualitative exercise, concerned with specific subjects in an individual context. In this context, a descriptive approach to identifying students' clinical knowledge and skill would be the preferable research method since such perceptions are not quantifiable. They further acknowledged that personalized assessment in development and practice of self-assessment skills should be a target of future research beyond the quantitative research paradigm.

The purpose of our qualitative investigation was twofold. First, in 2000, the dental hygiene program

under investigation received a Council on Dental Accreditation (CODA) site visit recommendation related to Dental Hygiene Accreditation Standard 2-25: "Graduates must be competent in the application of self-assessment skills to prepare them for lifelong learning."²⁵ To address the CODA recommendation, efforts were made to implement self-assessment in the curriculum. Our research study was an attempt to develop an understanding of students' perceptions of and experiences with self-assessment in their education prior to entering the dental hygiene program. First-hand observations by the principal investigator beginning in 2004 while working as an instructor in the two-year entry-level dental hygiene program raised the question as to whether the 2000 self-assessment methods were truly effective in meeting the CODA standard. Quite often, the general attitude of students was "just tell me what I need to know to pass the test." Frequently, self-assessment was seen as "busy work," and students wrote the same thing repeatedly just to be finished. The secondary goal of this study was to gather program-specific information that could be used to advance student self-assessment as an integral part of authentic assessment in the dental hygiene curriculum.

Methodology

This study utilized the qualitative methodology of phenomenological inquiry to explore the perceptions of dental hygiene students with regard to the use of self-assessment both prior to entry in the dental hygiene program and in their clinical experiences during program matriculation. Phenomenological studies offer detailed descriptions about individual situations. The primary process of collecting information involves in-depth interviews of a few subjects, typically three to ten individuals. With phenomenological inquiry, Creswell states, "the important point is to describe the meaning of a small number of individuals who have experienced the phenomenon."²⁶ Often phenomenological inquiry may not lend itself to direct generalization of findings in the same way as quantitative research.^{26,27} However, this methodology is appropriate for this setting, as the examination of undergraduate student perceptions of self-assessment has not been previously studied in dental hygiene. While the findings of this investigation may not be generalizable, they can result in hypothesis-generating research that may then be

further studied. The research questions that guided this investigation are shown in Table 1.

This research was conducted by the principal investigator in fulfillment of the graduate requirements of the master's of science degree in dental hygiene education at the University of Missouri-Kansas City School of Dentistry. Permission to conduct the research was given by the University of Missouri-Kansas City Social Services Institutional Review Board. Additionally, the dental hygiene program under investigation granted permission to access student information for the purpose of this study.

The study participants were an intact second-year dental hygiene class of students (n=17) completing their final semester in an associate of applied science degree program in dental hygiene. At the time of this investigation, various opportunities for student self-assessment were included in all semesters of the program under investigation. However, no formal explanation of the process was included in new student orientations. Table 2 shows the demographics of the study population upon program entry.

Data for this research were obtained from three sources: 1) responses from a program-designed self-assessment survey assignment given to all seventeen second-year students at the beginning of their final semester in the dental hygiene program; 2) in-depth interviews with four of the second-year dental hygiene students in their final semester of the program; and 3) self-assessment examples from program-designed clinical competence evaluation forms collected from all seventeen students in the final semester of the program.

As a result of responding to the recommendation from CODA during the site visit in 2000, the dental hygiene program implemented an assignment given to students at the beginning of their final semester aimed at reviewing student utilization of clinical self-assessment. This assignment was updated by the program periodically, and the most recent version

(revised 2007) was in place at the time of this study. Program-developed reflective open-ended questions in survey format were designed to ascertain whether students understood how and why self-assessment was used in clinical dental hygiene practice in an attempt to determine whether additional review of the process was needed prior to graduation. Responses were kept anonymous to encourage students to be frank and candid in answering all of the questions. Assignment responses served as a first source of data.

Stratified purposeful sampling was utilized to select four students for in-depth interviews with the principal investigator to provide the second data source. Stratification was based on two criteria: age and grade point average (GPA) at time of program entry. Research has shown that GPA may be used as a predictor of success in dental and dental hygiene education.^{28,29} Additionally, the literature suggests that non-traditional college-aged students (age twenty-five and older) may be more likely to develop a deeper comprehension focus in their approach to learning, whereas younger students might be more apt to assume a surface-level assessment approach to learning.¹⁹

The third source of data—clinical competence evaluation forms obtained from the fourth-semester clinic—included a self-assessment component that students completed during each patient experience. These forms are introduced to students at the beginning of their second semester as they begin providing patient care in the dental hygiene clinic and are used throughout the program to evaluate progress toward clinical competence. Students set daily clinic objectives and are encouraged to self-assess their progress toward meeting or learning from those objectives. Prior to the year 2000, these forms did not contain student self-assessment data. As a result of the 2000 CODA site visit, the form was revised to include the self-assessment component. To obtain a comprehensive data sample, competence evaluation forms were

Table 1. Preliminary research question and sub-questions of study

Preliminary Research Question	Sub-Questions
1. How do undergraduate dental hygiene students learn and perceive the process of self-assessment?	1. How do dental hygiene students define self-assessment? 2. What experiences have students had with self-assessment prior to entering the dental hygiene program? 3. Do students feel adequately prepared to self-assess when beginning the dental hygiene program? 4. What value do students place on the ability to self-assess?

evaluated from semester onset to midterm and from midterm to end of semester.

Inductive data analysis, with emphasis on the specific approach recommended for phenomenology, was used in this study. While it is impossible to totally eliminate researcher bias, one strategy used in qualitative research is to be conscious of one's biases while conducting the study in an attempt to accurately represent the data. To ensure validity and reproducibility of the data, all interviews were audio-recorded and professionally transcribed. Another qualitative strategy, member checking, ensures that the researcher is representing correctly the intent of the individuals being interviewed. Student interviewees in this study were given a copy of their own interview transcripts and the opportunity to provide further clarification or make changes. Additionally, prolonged engagement of the researcher with the students in the clinical setting was used to minimize bias and establish credibility. Prolonged engagement refers to the time the researcher invests to sufficiently understand the environment under study.³⁰

Multiple methods of data collection allowed for triangulation of the data. Analysis of the interview transcriptions, course-required assignments, and examples of student clinical self-assessment provided valuable insight into student perceptions of program self-assessment. Due to potential bias as a result of the principal investigator's being a faculty member of the program under investigation, data were examined by the principal investigator and two external faculty reviewers with significant knowledge in qualitative research.

Results

Analysis of the interview data resulted in four major coding categories: 1) educational preparation, 2) orientation, 3) awareness, and 4) value. Table 3 shows the emergent categories with representative themes of each. Triangulation of data from the program-designed survey assignment and program-designed clinical competence evaluation forms corroborated coding categories and themes.

Educational Preparation

Students participating in the interviews openly described the unfamiliar nature of self-assessment, with comments like these: "That's [self-assessment] something that's been new to me in the dental hygiene

Table 2. Demographic and educational information on students in study (N=17)

	Number (%)
Gender	
Female	17 (100%)
Male	0
Age	
18–22	9 (52%)
23–28	3 (18%)
29–35	2 (12%)
36 and over	3 (18%)
GPA	
2.5–2.7	0
2.8–3.0	0
3.1–3.3	2 (12%)
3.4–3.6	3 (18%)
3.7–4.0	12 (70%)
Ethnicity	
Caucasian	17 (100%)
Hispanic	0
African American	0
Self-reported experience with self-assessment prior to dental hygiene education	
None	9 (52%)
Minimal	4 (24%)
Life experience	4 (24%)

Table 3. Emergent categories of student perceptions with representative themes

Educational Preparation
No past experience
Never been asked to do before
Lack of ownership
Orientation
Need direction
Not important
Waste of time
Awareness
Focus on negative
Not safe
Constructivism
Critical thinking and problem-solving
Value
Sense of accomplishment
Competence and validation
Value in profession

program”; “I had never even heard of self-assessment until I got into this program”; and “I have an associate degree in general studies and I was in college for a total of three or four years [prior to entering the dental hygiene program] and I have never had any classes that focused on self-assessment.”

Another student response indicated frustration when asked to self-assess in clinic because she had never been asked to self-assess prior to entering the dental hygiene program:

[In clinic] we were given forms that said self-assess, and as we discussed you're not taught that in any other program, in any class and it's like “What does that mean?” or “What do I write?” At first I wrote, if you look back at my papers I've written two words: “Did fine,” or “Had a bad day”; you know, I didn't get into the depth of what I could have if it [self-assessment] had been explained to me.

Another student stated: “My personality was a self-assessor. I've always been a type A personality, so I was always self-assessing myself, but I'd never been asked to write down any thoughts about my performance in a subject or anything like that.”

Of the students citing “life experience” with self-assessment, some seemed to have a very basic understanding of the concept, as in this example:

I am 41 years old. I do have a degree related to Medical Secretary. . . . [My] experience with self-assessment is probably more life experience . . . my previous jobs and bookkeeping, and all that. You have to keep constant check on yourself. At my work we have a field trainer program and we train new employees and try to help make ourselves better at the same time. We also do a mentoring program . . . you know, we watch them and then they watch themselves. And we're like, “Where are you struggling, and if so how do you think you can fix it?” I just personally evaluate myself at the end of each day and when difficult relationship issues come up.

A lack of past experience in self-assessment was also confirmed through document analysis of students' written self-assessment course assignment. Nine of seventeen students reported absolutely no exposure to self-assessment in any previous coursework

taken prior to entering the dental hygiene program. Four of the students replied with “not much.” The final four students described their exposure to self-assessment more as “life experience.”

An additional source of corroboration, the program-developed course survey that was administered during students' fourth semester, found the same issues with students' expressing frustration about lack of experience with self-assessment skill development prior to program entry, as in these comments: “Sometimes it is hard to put things into words, especially when an instructor reads it because I would worry that they would disagree”; “I wasn't sure what to write”; “I don't usually know what to say”; and “I've only now learned what we were really expected to write on the forms.”

Comments from the clinical competence forms further demonstrated the challenge some students faced when attempting to self-assess during patient experiences. One student listed her daily clinical objective as “complete a child patient” and followed up with “difficult to get x-rays” as her self-assessment. The instructor working with her had to ask, “What will your strategies be when treating a child next time? How will you learn from this today?”

An interesting theme related to a sense of lack of ownership emerged during analysis of all three sources of data. Lack of ownership implies an attitude of not wanting to accept responsibility for one's part in his or her own education, which is in direct contrast to becoming a self-directed learner since “self-directed learning is the ability to direct one's own learning experience.”⁵ Multiple students in our study wanted the instructor to complete the patient assessment “for the grade” first and then go back and make comments based on instructor remarks. Some would just give up and ask the instructor to “do the procedure” for them. Often students did not even fill out the self-assessment component of the clinical competence evaluation form at all. Interview responses revealed similar thought processes: “I've always thought of self-assessment as your grade. Your grade shows how you did”; “I never know what to write. I just do better from other people assessing me”; and “I think if somebody would've just told us that you wanted us to do it [self-assess during clinic], how important it was . . . and just so many things are going on in there [clinic] . . . but I don't think any of us really realized what you wanted us to do. I thought it [the self-assessment component of the form] was just the ‘I didn't do this right today,’ end of story.”

Orientation

At the time of this investigation, no formal orientation to self-assessment was given to new students entering the program. The need for specific orientation to self-assessment at program onset was an emergent category during analysis. General lack of knowledge with regard to the purpose and process of self-assessment became evident as a constant theme throughout the interviews and the written survey assignments. When asked about using self-assessment as measurement to follow one's progression of skill development, responses indicated that many students did not feel adequately prepared to self-assess upon entering the program. In contrast to educational preparation that dealt with experiences prior to entering dental hygiene, this category dealt with the issue of orientation once in the program. Comments included the following: "I never actually thought about it [self-assessment] before the program"; "I dread self-assessment"; "Having never done it [self-assessment] before, I did not feel confident, so I didn't do it"; and "Sometimes it is kind of complicated for me."

Interview responses indicated that some students would have appreciated more guidance with the self-assessment process at the beginning of the program: "Just explain it [self-assessment] a little more . . . you're not taught in any other program or class . . . and you know, explain that it's going to feel awkward at first to do it, so that we would be a little more open to it"; "Explain the importance and the reason for it [self-assessment] at the beginning of the program"; and "I think when we were in our preclinical studying and you have us self-assess at the end of the day after learning a new skill, I think that was great. I liked it even though at the beginning I wasn't sure about how to go about writing, you know, just going through and then once I really thought about what you [instructor] were aiming for, it actually really improved things."

Prior to midterm in their final semester, some students were still unclear regarding the exact process of self-assessment. In many cases instructors could recognize that learning was occurring through student evaluations, but assistance with completing the operator self-assessment component during the patient experience was still necessary. The discord between setting daily clinical objectives and self-assessing was captured on some of clinical competence evaluation forms collected in the months leading up to midterm. Excerpts are shown in Table 4.

Several responses in the data revealed student feelings that self-assessment was not important or was simply a waste of time. These findings were consistent with the overall sense that students felt a lack of instruction as to why self-assessment was an essential part of clinical skill development. Examples include the following: "In the beginning, I didn't think it [self-assessment] was important"; "Sometimes it [self-assessment] seemed like a pain to do . . . not something that was really important to me"; "You would just fill in the box [on the clinical competence evaluation form] to fill in the box"; "At first it was 'What is this? What do they mean?' It seemed silly"; and "Honestly, I don't think I will really use this [self-assessment] after graduation."

Awareness

Another category that emerged was that of awareness. Analysis of interview data confirmed that in many instances students made the shift from unaware to aware as it related to the intention and benefits of utilizing self-assessment. Initially, the feeling of not being safe to put one's thoughts out in the open or that self-assessment focused on the negative seemed to impair some students, as in these comments: "It [self-assessment] is a hard thing for me. . . . I tend to be very, very, hard on myself, so I focus on the negative and not the positive. I'm

Table 4. Excerpts from daily clinical objectives and self-assessment taken from clinical competence evaluation forms (prior to midterm of the final semester)

Daily Clinical Objectives	Self-Assessment
Improve time management; work on effective calculus removal and patient/clinician communication.	Good overall experience; would still like to work faster.
Complete quadrant of calculus identification on medium patient.	Patient had lots of subgingival medium calculus. Had to explain things to him with Spanish brochures and flip charts. He doesn't speak much English.
Take panoramic film without flattening the smile.	Make sure not to release button on pan machine too soon; had to start all over.

going to have to always follow the negative with a positive, but it is very difficult for me”; “We’re all used to critiquing ourselves in the negative way, but sometimes when you do deserve a pat on the back and you have to self-assess that you’ve done well, [that] is an awkward thing for me”; and “At first it [self-assessment] was difficult because I have a tendency to be hard on myself.”

An example from one student’s clinical competence evaluation form revealed self-assessing only the negative aspect of her patient experience. The patient had very heavy black line stain that she was unable to remove completely on her own. While she successfully accomplished all other aspects of her treatment plan, her only focus during self-assessment was the fact that she needed assistance removing the black line stain. Her instructor commented, “Black line stain is probably the most frustrating to remove,” and even remarked that the student provided good treatment and patient management.

While many students doubted their abilities initially, data analysis did reveal a transition from the perception of self-assessment as being negative to appreciating that the process could be very beneficial. Constructivism is the ability to link previous knowledge with new knowledge.³¹ As students began recognizing their ability to link those two components of knowledge, they began to feel that they could rely more on their own decision making and less on that of an instructor, and their perceptions of self-assessment changed considerably. For example:

When coming into a situation, your previous knowledge and now your current knowledge and how you have applied it and how teachers [perceive] how you are applying your skills . . . can help you better yourself. It is [not used] to criticize, but it is something that could help you.

Thinking about how we can change what we are doing in there [clinic] to help ourselves and that it is not a spot for teachers to tell us how to fix it [a challenge]. It’s become very useful.

It [self-assessment] could be a good thing for those who take it seriously. . . . If you have a group of people who really think outside of the box and pay attention to how they go through their actions when treating a patient and write it down, it could be positive to have

the instructors see what we see and that we have tried.

A student taking radiographs on a partially edentulous patient set a daily clinical objective on the clinical competence evaluation form to “successfully complete two periapical and two bite wing films on partially edentulous patient.” Her self-assessment was “very hard to take films on patient with so many missing teeth. Used cotton rolls but still challenged.” The instructor then commented, “Good try; you might consider using the snap-a-ray [next time].” Positive learning occurred during the interaction between the student’s self-assessment and instructor’s recommendation. After speaking with her instructor, the student followed up her entry and noted that she had not thought about the snap-a-ray but would try it in the future.

Positive changes in student self-assessment skills did begin to manifest as students progressed through the program. The faculty discussed challenges with self-assessment after midterm conferences in the final semester, and a decision was made to make a more concerted effort to help students expand their knowledge of the self-assessment process. Once the students were reassured, either by faculty input or through repeated experiences with a particular skill, they naturally began to change the way they determined their daily clinical objectives and resulting self-assessment. Comments reflecting these changes may be seen in Table 5.

Interview transcriptions and assignment responses during the final semester of the program revealed the development of student understanding of how self-assessment incorporates into the process of critical thinking and problem-solving, as in these examples: “I did realize that I can figure things out for myself and I don’t have to go ask a teacher ‘what am I doing wrong?’ So, it [self-assessment] taught me to be a little more independent in my thinking and fixing my own problems”; and “I use it [self-assessment] to evaluate whether I accomplished something; if I didn’t, I say what do I need to do to get better, or if I excelled at something, I can make a note to use my time more efficiently in other areas instead of just focusing on that same thing.”

Value

Toward the end of the program, students began to perceive the value of being able to self-assess their clinical skills and rely less on instructor input. In the final weeks, students exhibited a certain amount of

Table 5. Excerpts from daily clinical objectives and self-assessment taken from clinical competence evaluation forms (post midterm to the end of the final semester)

Daily Clinical Objectives	Self-Assessment
Identify where subgingival calculus is located and remove it.	Able to feel calculus. Very tenacious calculus. Sometimes must go back with a hand instrument because ultrasonic just won't remove all of it.
Thorough evaluation of existing restorations.	
Complete half mouth quad scale.	Missed 2 Class III composites on #22 and #27; need to use air and pay more attention to composites. Realized I need to go more sub with instruments. Feel like I am learning more about fine scaling and learning to know what I am feeling for.

satisfaction and accomplishment as they were able to make decisions on their own. They relied less on instructor input and took more ownership for their decision making. Comments included the following: "It [self-assessment] helps me know when I've reached what I feel to be perfection"; "Using self-assessment has helped me pinpoint areas I need to work on professionally and personally"; "I like self-assessment because it allows me to recognize my own progress"; and "It gives you a sense of accomplishment to actually feel like you have learned something . . . and to take the time to realize what you've learned."

During analysis of the interviews and written assignment, many students expressed more willingness to trust in their own assessment and critical thinking abilities, although some still wanted teacher validation before they truly believed in themselves. Comments included these examples: "I don't mind it [self-assessment] so much anymore. It forces you to find strengths and puts your weaknesses into perspective"; "I see the importance because when I have areas of difficulty, I now recognize what I might want to have addressed by faculty if needed"; "I think it [self-assessment] is helpful. I can look back now and see areas that were challenges for me. . . . I can see how I am improving"; "You know where you stand on certain skills and levels of achievement, but ultimately the teachers are more knowledgeable"; and "It'll come naturally to me because ya'll have taught us for two years how to do it. . . . I will naturally be able to assess whether I did my best on each patient and it'll always give me a goal . . . give me something to work towards."

Interestingly, only one student said she "honestly may not use this [self-assessment] after graduation"; yet she had declared, on more than one occasion, that "self-assessment helps me know where I

need improvement. . . . I like doing it because if you are really able to point out what you are doing wrong, you know how to make it better." These different responses could be attributed to the student trying to say what she thinks the teacher wants to hear. However, the majority of students with initial reservations about the use of self-assessment were able to identify personal benefits of the process in clinical decision making after graduation, as in these comments: "I will use self-assessment to remember my reasoning for wanting to become a dental hygienist and to keep my ethics strong"; "I'll use it [self-assessment] to keep from becoming complacent. I want to be active and up-to-date and not settle into a routine"; "I will be able to gauge how my clients respond to me and to treatment . . . make changes based on those experiences"; and "I always want to feel that I am learning and doing a service to the patient."

Discussion

Current educational theory regards critical thinking as foundational to teaching and learning. As dental hygiene students matriculate through an undergraduate program, it is essential that they move from a position of relying on instructor judgments of their performance to the position of becoming realistic self-evaluators. A competency-based educational program grounded in promoting the use of critical thinking develops self-directed, self-aware, and self-corrective learners. Realistic self-evaluation is a defining characteristic of the competent health care professional.^{1,4,32}

This exploration of dental hygiene students' experience with self-assessment supports the observation that learner awareness and implementation of self-assessment closely follow the stages of the com-

petency learning continuum.^{8,9,16} Changes in learner self-awareness of competence serve as important transitional landmarks along the learning continuum as described by Hendricson and Kleffner.^{9,16} Applying their interpretation of the novice-expert learning continuum to the program under study, dental hygiene students entered the program as “unconscious incompetents” with a lack of knowledge and skill related to utilizing self-assessment—almost a pre-novice stage of the continuum. Typically, individuals at this early stage of development are enthusiastic about entering their professional training but naïve about difficulties of the learning tasks ahead.^{9,16} General lack of knowledge with regard to the purpose and process of self-assessment in the dental hygiene program became evident as a constant theme in the interview transcriptions and survey assignments of this study.

Reflective analysis of the data indicated that a majority of the students did not feel adequately prepared to self-assess upon entering the program because they had not been exposed to self-assessment in any prerequisite coursework. While it is unlikely that students had not experienced some form of self-assessment in their prior education, it is more likely that they did not transfer what they had experienced previously to what they were being asked to do in their new role as a student clinician. In other words, they might have been more capable of self-assessing their writing than their thought processes. This line of thinking parallels findings in the BEME review, which suggested that practical tasks lend themselves to self-assessment more readily than cognitive tasks.²⁴

Dental and dental hygiene programs across the country utilize self-assessment as one of several components in evaluating clinical skill development.³³⁻³⁵ During the initial phase of learning, students benefit from orientation to program objectives and competencies. At the time of this study, our program did not include formal introduction to any specific curriculum competencies during orientation sessions held prior to or at the start of the first semester. An expectation existed that students entering the program would do so fully equipped with the skill set needed for higher levels of critical thinking. In dental hygiene education, professional self-assessment is not inherent; rather it is a skill that must be learned. Specific criteria against which to measure are necessary to help students develop proficiency in the level of self-assessment used as a practicing clinician. The literature suggests that including formal training or an evidence-based self-assessment educational module

in a dental hygiene curriculum could enhance student aptitude and perception of the process used during clinical practice.^{22,36} Triangulation of data sources demonstrates that the students in our study did advance in their practice of self-assessment, although their perceptions would have been more positive had formal instruction about how one was supposed to self-assess and how self-assessment would be utilized been given at the onset of the program.

As students advance along the continuum, they move to the stage of “conscious incompetent,” during which students become acutely aware of their limitations. Often negative self-talk or undue focus on perceived weaknesses hinders the learning process. Students at this point may appear apathetic or defensive. They are so concrete in their thinking that they become hesitant to let go of their reliance on direct instructor input and take on a “just tell me what to do” thought process. Evidence of this mindset was clearly expressed in our study when students asked instructors to complete the patient assessment form “for the grade” first so the students could go back and make their comments based on instructor remarks or when they would just give up and ask the instructor to do the procedure for them.

What appeared as an initial attitude of indifference may have been a respondent’s attempt to hide her lack of knowledge in a specific area. Anticipation regarding peer and instructor judgment or what is often termed constructive criticism can undermine a student’s progress or self-confidence. Thus, lack of confidence in one’s abilities may hinder the motivation to self-assess.²³ The all-female population sample of this investigation presented a potential limitation in the study’s results. According to the BEME report, gender may factor into individual self-confidence and self-assessment. Among the studies reviewed by the BEME, some researchers concluded that female students tended to underestimate their abilities more often than do their male counterparts.²⁴

Instructor feedback and reinforcement are critical in helping students advance to the next stage of the learning continuum. Through the reinforcing effects of instructor guidance along with extensive practice, trial and error, and increasingly encouraging results, students can advance to becoming a “conscious competent.” Frequent opportunities to use reflective judgment and analyze problems presented during patient care facilitate the skill development that allows the conscious competent to rely less on instructor input and more on her own decision making abilities.

Evidence in our data analysis indicates that as students began to combine previous knowledge and current knowledge, they were able to transition from a state of instructor dependence to a state of self-reliance exhibited by entry-level autonomous clinicians. Additionally, some students truly recognized their own shortcomings with self-assessment, indicating that they did come to learn how to self-assess. The majority of students with initial reservations about the use of self-assessment in the program were able to identify personal and professional benefits of being able to self-assess and how they would incorporate those into clinical decision making after graduation. However, self-assessment of practical dental hygiene applications, such as biofilm and calculus removal, was undoubtedly easier for most students when compared to assessing their reasoning for treatment decisions or strategies. Even students who were high academic performers still doubted their abilities in hands-on and cognitive tasks in the clinic setting up to graduation.

Conclusion

The ability to accurately self-assess is considered a hallmark of clinical competence and is therefore necessary for the development of competent graduates. Long-term outcomes of accurate self-assessment instruction are critical for graduating dental hygienists capable of sound critical thinking and problem-solving. This qualitative study provides data intended to contribute to the ongoing development of dental hygiene educational best practices. Understanding what students bring to their professional program is part of identifying learning needs and learning styles. While it is unlikely that students have not experienced some form of self-assessment in their prior education, it is more likely that they are not transferring what they have previously experienced to what they are being asked to do when entering a professional program.

Teaching students how to self-assess is an important step in preparing dental hygienists for autonomous clinical practice and lifelong learning. Oftentimes dental hygiene faculty expectations may be misaligned with student perceptions when entering a program. Findings from this study may give direction to changes needed in orientation to the process of self-assessment in the dental hygiene curriculum to support the development of critical thinking and problem-solving skills. Inclusion of a

formal orientation to self-assessment as it will be utilized is an essential component in facilitating student understanding of the true purpose in developing competence in the process.

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