

# Graduating dental hygiene students' attainment of the CDHA baccalaureate competencies: Students' self-ratings

Susanne Sunell\*, EdD; Denise M Laronde<sup>§</sup>, PhD, RDH; Zul Kanji<sup>†</sup>, EdD, RDH

## ABSTRACT

**Problem statement:** In 2015 the Canadian Dental Hygienists Association published the first *Canadian Competencies for Baccalaureate Dental Hygiene Programs*. To date there is no scientific evidence to support that graduates from baccalaureate programs have gained these abilities. **Purpose:** To explore the confidence levels of graduating dental hygiene baccalaureate students in their ability to demonstrate the national baccalaureate competencies. **Methods:** This article examines the preliminary frequency data from the first year of a 3-year longitudinal study involving the graduating students within the University of British Columbia dental hygiene baccalaureate program. An online, anonymous survey was conducted with these students to rate their confidence level based on a 5-point scale ranging from not confident to confident in the national competencies that include 13 domains with 110 associated subcompetencies. **Results:** Seventeen of the twenty-two graduating students responded to the survey for a 77% response rate. The competency areas in which they expressed the highest confidence were collaboration (100%), clinical therapy (100%), oral health education (90%), disease prevention (86%), professionalism (82%), and integration of knowledge (80%). The areas in which they expressed the least confidence were policy use (20%) and advocacy (11%) where some respondents were not confident, somewhat confident or unsure. **Conclusion:** These data provide the faculty with important insights to support curriculum revisions, particularly in the policy use and advocacy domains. The data also contribute to a broader national discussion about the baccalaureate competencies and an exploration of the subcompetencies that may be beyond the scope of baccalaureate education.

## RÉSUMÉ

**Énoncé du problème :** En 2015, l'Association canadienne des hygiénistes dentaires a publié la première édition des *Compétences canadiennes à l'égard des programmes de baccalauréat en hygiène dentaire*. Jusqu'à maintenant, aucune preuve scientifique ne confirme que les diplômés de programmes de baccalauréat ont acquis ces habiletés. **Objectif :** Explorer le niveau de confiance des finissants du programme de baccalauréat en hygiène dentaire dans leur capacité à démontrer qu'ils ont les compétences nationales du baccalauréat. **Méthodologie :** Cet article examine la fréquence de données préliminaires de la première année d'une étude longitudinale de 3 ans impliquant les finissants du programme de baccalauréat en hygiène dentaire de l'Université de la Colombie-Britannique. Un sondage anonyme a été mené en ligne auprès de ces étudiants afin d'évaluer leur niveau de confiance d'après une échelle de 5 points allant de « non confiant » à « confiant » dans les compétences nationales qui comprennent 13 domaines et 110 sous-compétences associées. **Résultats :** Dix-sept des vingt-deux finissants ont répondu au sondage, pour un taux de réponse de 77 %. Les domaines de compétence dans lesquels ils ont exprimé le plus de confiance étaient la collaboration (100 %), la thérapie clinique (100 %), l'éducation en matière de santé buccodentaire (90 %), la prévention des maladies (86 %), le professionnalisme (82 %), et l'intégration des connaissances (80 %). Les domaines dans lesquels ils ont exprimé le moins de confiance étaient l'utilisation des politiques (20 %) et la défense des intérêts (11 %), alors que certains répondants n'étaient pas confiants, étaient légèrement confiants ou incertains. **Conclusion :** Ces données fournissent de l'information importante au corps professoral pour appuyer les révisions aux programmes, particulièrement dans les domaines de l'utilisation des politiques et de la défense des intérêts. Les données contribuent aussi à une vaste discussion nationale sur les compétences de baccalauréat et une exploration des sous-compétences qui peuvent être au-delà du champ d'activités de la formation menant au baccalauréat.

**Keywords:** baccalaureate education, competencies, competency-based education, dental hygiene, dental hygiene education, professionalism, self-confidence

**CDHA Research Agenda category:** capacity building of the profession

\*Part-time faculty, Oral Biological and Medical Sciences, University of British Columbia, Vancouver, BC, Canada

<sup>§</sup>Associate professor, Oral Biological and Medical Sciences, University of British Columbia, Vancouver, BC, Canada

<sup>†</sup>Director, Dental Hygiene Degree Program, Oral Biological and Medical Sciences, University of British Columbia, BC, Canada

Correspondence: Susanne Sunell; [ssunell@shaw.ca](mailto:ssunell@shaw.ca)

Manuscript submitted 15 November 2018; revised 14 March 2019; accepted 1 April 2019

©2019 Canadian Dental Hygienists Association

## WHY THIS ARTICLE IS IMPORTANT TO DENTAL HYGIENISTS

- Self-confidence has been described in health care studies as an important indicator of competence.
- Graduating baccalaureate dental hygiene students expressed most confidence in the domains of collaboration, clinical therapy, and oral health education, and least confidence in the domains of advocacy and policy use.
- These findings may be used to support curriculum revisions and contribute to a broader national discussion about baccalaureate competencies for dental hygiene education.

## INTRODUCTION

In 2015 the Canadian Dental Hygienists Association (CDHA) published the *Canadian Competencies for Baccalaureate Dental Hygiene Programs*.<sup>1</sup> This document represented a new national standard in dental hygiene education that was built upon the national entry-to-practice competencies and practice standards.<sup>2</sup> It was generated through a Delphi study<sup>3,4</sup> involving experts in the profession and supported by the input of an advisory committee of Canadian regulators and an accreditation representative as well as national and international program directors from baccalaureate and master's degree programs. It is important and timely to explore how this national standard compares to the outcomes of baccalaureate dental hygiene education.

The development of national ability statements has been an ongoing project for many years in the Canadian dental hygiene profession. The first competencies developed in the 1980s were specific to the clinical scope of dental hygiene practice with a focus on its technical aspects.<sup>5</sup> Over the years the ability statements were broadened to include competencies in the areas of health promotion, disease and injury prevention, education, and advocacy.<sup>2,5</sup> General professional abilities common to all health professions were also more explicitly stated,<sup>6,7</sup> such as professionalism, collaboration, communication, coordination, and evidence-based decision making. Several national organizations were engaged in articulating dental hygiene abilities, including the Association of Canadian Faculties of Dentistry, the Canadian Dental Hygienists Association, the Commission on Dental Accreditation of Canada, Dental Hygiene Educators Canada, and the Federation of Dental Hygiene Regulators of Canada.<sup>5</sup>

During the years when national baccalaureate competencies were not available, the faculty at the University of British Columbia (UBC) generated baccalaureate program competencies that were integrated into the program in 2009.<sup>8</sup> In 2016 the UBC faculty and students then shifted to the new CDHA competencies; the 2 documents shared many similarities. As is common in postsecondary programs, students are evaluated to competence by both faculty members and peers through course work in a variety of learning environments on campus and in community settings; self-assessment is also integral to clinical and community assessments. Exploring the learners' views from the perspective of their self-confidence was considered an important way of gaining additional insight into the outcomes of their education.

The exploration of dental hygiene students' self-confidence is an important aspect of professional education given its relationship to professional competence.<sup>9-11</sup> The concept of "confidence" is described as being the "quality or state of being certain," with self-confidence defined as "confidence in oneself and in one's powers and abilities" (<https://www.merriam-webster.com/dictionary/self-confidence>). It is common to find terms such as confidence,

self-confidence, and self-efficacy used as surrogate terms for professional confidence.<sup>12,13</sup> The term self-confidence is more commonly found in professional educational literature whereas self-efficacy is more common to psychological literature.<sup>14</sup> The 2 terms are often used interchangeably thus making their differentiation difficult.<sup>13,14</sup>

The concept of "self-confidence" is used in this study as a measurement of competence as it has in other professional health care studies.<sup>10,15-17</sup> It is recognized that there are mixed findings related to the congruence between "self-confidence" and the assessment of competence by qualified assessors.<sup>18,19</sup> While it may not be appropriate for regulatory purposes, self-confidence appears to be a reasonable measure to gain aggregated student input for curriculum revisions<sup>9-11,15,16,20</sup> given the caveat that it has limitations, as do all measures involving self-reporting. Self-confidence has also been described as an important indicator of competence,<sup>9,10,12-15</sup> so it would be useful to explore the self-confidence of students. Dental hygiene students' self-confidence should receive greater attention as a concept worthy of investigation as few such studies currently exist in dental hygiene literature.<sup>21</sup>

The authors of CDHA's baccalaureate competencies<sup>1</sup> urged the profession to further investigate the competencies through the input of students, educators, and other practitioners. The experts in the associated Delphi study<sup>3,4</sup> articulated the competencies and viewed them as relevant and realistic. However, beyond the Delphi study there are no other studies to suggest that the national competencies reflect the outcomes of baccalaureate dental hygiene education in Canada. With this in mind, the UBC faculty initiated a longitudinal study to explore the confidence levels of graduating baccalaureate students in their abilities to demonstrate CDHA's baccalaureate competencies. Such data were viewed as critical to the ongoing curriculum review and revision process so important within postsecondary education. This study was designed to initiate a discussion about professional self-confidence and competence within the context of CDHA's baccalaureate competency profile.

## METHODOLOGY

This article examines the preliminary frequency data from the first year of a 3-year longitudinal study involving the graduating students from 2017 to 2019. The study was based on the following research question:

How confident are the graduating dental hygiene baccalaureate students in their ability to demonstrate the national baccalaureate competencies?

The survey instrument approved by the UBC Behavioural Research Ethics Board (H17-00109) was organized into the 13 domains of the CDHA document<sup>1</sup> with their 110 associated subcompetency statements ([http://www.cdha.ca/pdfs/profession/CCBDHP\\_report.pdf](http://www.cdha.ca/pdfs/profession/CCBDHP_report.pdf)). The domains include shared competencies with other professions

Table 1. Range of the "mostly confident" and "confident ratings" and mode in each domain

Domains	Number of subcompetencies	Range of mostly confident and confident ratings (%)	Range of mostly confident and confident ratings excluding outliers <sup>a</sup> (%)	Range of mode <sup>b</sup> ratings
<b>Knowledge of the discipline competency</b>				
Integration of knowledge of the discipline	5	30–94	76–94 (1 outlier)	Not sure–mostly confident
<b>Core competencies</b>				
Professionalism	11	70–100		Mostly confident–confident
Communication	9	35–100	65–100 (1 outlier)	Somewhat confident–confident
Collaboration	6	76–100		Mostly confident–confident
Coordination	9	30–100	77–100 (2 outliers)	Somewhat confident–mostly confident
Research use	11	53–94	71–94 (1 outlier)	Mostly confident–confident
Leadership	9	65–100		Mostly confident–confident
<b>Dental hygiene service competencies</b>				
Health promotion activities, initiatives & programs	10	41–100	65–100 (1 outlier)	Not sure–confident
Disease prevention activities, initiatives & programs	7	65–100		Mostly confident
Oral health education	10	53–100	83–100 (1 outlier)	Somewhat confident–mostly confident
Advocacy	9	24–71	47–71 (1 outlier)	Somewhat confident–mostly confident
Policy use	5	47–77		Somewhat confident–mostly confident
Clinical therapy	9	82–100		Mostly confident–confident

<sup>a</sup>Outliers were defined as any subcompetency with a 20% or greater rating difference from the other ratings.

<sup>b</sup>Most frequent rating by study respondents. The ratings for individual subcompetencies are found in Appendix A online.

such as professionalism, communication, collaboration, coordination, research use and leadership, and specific dental hygiene competencies such as health promotion, disease prevention, oral health education, advocacy, policy use, and clinical therapy. Respondents were asked to rate their confidence in each of the domain subcompetencies using a 5-point rating scale ranging from not confident to confident. The scale included a "not sure" option to determine the number of students who were not comfortable with the other options.<sup>22,23</sup> Optional open-ended questions were included so respondents could clarify their ratings.

The concept of self-confidence has provided useful results in the health professions including nursing,<sup>15,16</sup> midwifery,<sup>10</sup> medicine,<sup>17</sup> dental hygiene,<sup>21</sup> and dentistry.<sup>11,20</sup> However, the findings about self-confidence ratings and self-ratings in general are nuanced and the results are mixed.<sup>19,22,25</sup> For example, there is evidence that self-ratings are more calibrated among those with more experience.<sup>24</sup> The ratings are also more calibrated for cognitive abilities than other abilities.<sup>25</sup> Prior to 2006, the majority of studies in medicine found that those with less competence tend to have more confidence than warranted

by their abilities<sup>19</sup> and those with the least amount of competence tended to have the most inflated ratings.<sup>25</sup> Using self-assessments may, therefore, not be helpful from a regulatory perspective with its focus on assessing individuals for protection of the public.

However, more recent studies found congruence between student ratings and faculty ratings.<sup>23,25</sup> These findings may be related to the growing evidence that self-assessment abilities can be learned,<sup>24,26</sup> particularly if people are guided by criteria associated with the ability.<sup>24-26</sup> A study by Metz et al.<sup>24</sup> found that self-assessment was influenced by experience to the point that there were no statistically significant differences between the ratings of fourth-year dental students in operative dentistry and those of faculty members. The Commission on Dental Accreditation of Canada standards ([https://www.cda-adc.ca/cdacweb/en/accreditation\\_requirements/dental\\_hygiene/](https://www.cda-adc.ca/cdacweb/en/accreditation_requirements/dental_hygiene/)) also reflect this perspective given that the ability of students to self-assess must be demonstrated. The students in our study were several weeks away from entry into the profession and had been working with such competencies<sup>8</sup> and their related assessment criteria

Table 2. Frequency data related to modes for subcompetencies in each domain

Domains	Frequency of modes for confidence ratings					Total <sup>b</sup>
	Not sure	Somewhat confident	Mostly confident	Mostly confident/ confident <sup>a</sup>	Confident	
<b>Knowledge of the discipline competency</b>						
Integration of knowledge of the discipline	1		4			5
<b>Core competencies</b>						
Professionalism			6	1	4	11
Communication		1	7		1	9
Collaboration			4		2	6
Coordination		2	5	1	1	9
Research use			9	1	1	11
Leadership			7		2	9
<b>Dental hygiene service competencies</b>						
Health promotion	1		8		1	10
Disease prevention			7			7
Oral health education		1	6		3	10
Advocacy		2	7			9
Policy use		1	4			5
Clinical therapy			6		3	9
<b>Total</b>	<b>2</b>	<b>7</b>	<b>80</b>	<b>3</b>	<b>18</b>	<b>110</b>

<sup>a</sup>Bimodal<sup>b</sup>Total number of subcompetencies per domain

for close to 4 academic years; hence they were in a good position to provide input on the national competencies for curriculum review and revision purposes.

The concept of “self-confidence” was also used given that it would be risky for students to divulge that they were not competent in the national competencies at their time of entry into the profession. Ethical guidelines suggest researchers should not ask respondents to incriminate themselves. Asking respondents to rate their self-confidence in the competencies through an online survey was regarded as being a safe way for learners to share their views—so critical to the assessment of these competencies—given that data were only reported as group data. The concept of self-confidence was used to support the truthfulness of the data.

While there are limitations to all self-reported data, this study focussed on the use of the group data to support curriculum review and development efforts. The methodology allowed the researchers to obtain important student perspectives with minimal resources<sup>20</sup> given that observer-driven study designs are expensive.<sup>17</sup>

A third-party recruiter delivered an electronic invitation that included a link to the survey on the UBC CoursEval platform. Students were invited to participate as close to program completion as possible while still providing them with 2 weeks to complete the survey. Participation was incentivized

through the option to enter a draw for several gift cards.

Quantitative data were analyzed by means of descriptive statistics using the SPSS Statistics for Windows, Version 25.0 software. Given the ordinal data the results were presented as percentages, ranges, modes, and quartiles. Future analysis will include inferential, non-parametric statistical tests once the 3-year study has been completed with the attendant increase in participant numbers. Thematic analysis was used to explore the written comments from the open-ended questions. This article reviews the preliminary frequency data from the March 2017 survey. Despite the small class size, the data provide an important starting point for a broader discussion about baccalaureate dental hygiene education and its outcomes.

A pilot phase was considered. However, there was no other comparable group to the UBC senior students as there were no other 4-year entry-to-practice dental hygiene baccalaureate programs in Canada at the time of the study. Using an international group would have been problematic given that they would not have been familiar with the competencies. The survey included 2 common rating scales as well as commonly used demographic questions. The competency statements (n = 110) formed the major part of the survey and they could not be altered. The cost-benefit analysis did not support the inclusion of a pilot phase.

Table 3. Quartile analysis based on subcompetencies per domain

Domains	Number of subcompetencies in each range based on sum of mostly confident & confident ratings				Summary	
	≤25%	Between 26% and 50%	Between 51% and 75%	>75%	% in upper quartile	Total number of subcompetencies
<b>Knowledge of the discipline competency</b>						
Integration of knowledge of the discipline		1		4	80	5
<b>Core competencies</b>						
Collaboration				6	100	6
Professionalism			2	9	82	11
Coordination		2		7	78	9
Leadership			2	7	78	9
Research use			4	7	64	11
Communication		1	3	5	56	9
<b>Dental hygiene service competencies</b>						
Clinical therapy				9	100	9
Oral health education			1	9	90	10
Disease prevention activities, initiatives & programs			1	6	86	7
Health promotion activities, initiatives & programs		1	2	7	70	10
Policy use		1	3	1	20	5
Advocacy	1	2	5	1	11	9

## RESULTS

Responses were received from 17 of the 22 graduating students (77% response rate). Sixteen (94%) of the respondents identified themselves as female and 1 (6%) respondent as male. With regard to their highest educational background upon entry into the program, 13 (76%) held a high school diploma, 1 (6%) held a diploma in another field, 1 (6%) had completed first-year university courses, 1 (6%) had completed second-year university courses, and 1 (6%) respondent entered with 6 years of university transfer courses in arts and sciences.

The majority of respondents (88%; n = 15) had lived in British Columbia prior to entering the program; 2 (12%) had lived in Alberta. The great majority of these graduating students were between 21 and 25 years of age (94%; n = 16) with one being between 26 and 30 years old.

The frequency data related to respondents' ratings for the 110 subcompetencies are found in Appendix A ([https://files.cdha.ca/profession/Journal/Sunell\\_AppendixA\\_v53n2.pdf](https://files.cdha.ca/profession/Journal/Sunell_AppendixA_v53n2.pdf)). To gain deeper insight into the respondents' views, the mostly confident and confident ratings were combined for each of the 110 subcompetencies in Appendix B ([https://files.cdha.ca/profession/Journal/Sunell\\_AppendixB\\_v53n2.pdf](https://files.cdha.ca/profession/Journal/Sunell_AppendixB_v53n2.pdf)). The raw and percentage data in these appendices may be of interest to educators

given that they provide specific information at the subcompetency level (n = 110).

For readers seeking a summary of the data from a domain level, Table 1 provides the range of the mostly confident and confident ratings as well as the mode (most frequent response) for the subcompetencies in each domain with and without outliers. Outliers were defined as any subcompetency with a 20% or greater rating difference from other ratings in the domain.

Table 2 provides a summary of the modes and highlights the domains in which the mode of some subcompetencies was in the somewhat confident or unsure category. There were no subcompetencies with a mode in the not confident category. In fact, the not confident category was rarely used; this rating was only applied 20 times (1%) in the overall data set of 1870 responses.

Each domain was then analysed to determine the number of subcompetencies per domain in the following percentage areas: ≤25%, 26% to 50%, 51% to 75%, and >75%. These quartile ranges were then used in the ranking of the domains. The domains with 75% or more of the subcompetencies in the upper range (4th quartile) were as follows (Table 3):

- Clinical therapy (100%)

- Collaboration (100%)
- Oral health education (90%)
- Disease prevention (86%)
- Professionalism (82%)
- Integration of knowledge (80%)
- Coordination (78%)
- Leadership (78%)

Having 75% or more of the subcompetencies in each domain rated mostly confident and confident was used as an indicator that respondents felt confident in the domain. This was the case for 8 of the 13 domains (62%).

The fourth-year students did not express as much confidence in the following 5 domains (38%):

- Health promotion (70%)
- Research use (64%)
- Communication (56%)
- Policy use (20%)
- Advocacy (11%)

These domains and their associated subcompetencies were explored to determine their nature.

While the domain of health promotion was not within the 4th quartile, it included an item related to the management of “incidents, outbreaks and emergencies,” and another item related to “system thinking.” The other subcompetencies in this domain were more highly rated (Table 1).

The subcompetencies in the communication domain (in which respondents expressed less confidence) included working with people of diverse backgrounds, health literacy skills, and working with information and communication technologies including those associated with business operations.

With regard to the research use domain, respondents expressed less confidence in abilities related to statistical tests, assumptions and biases, theoretical frameworks and processes, and oral health strategies.

The subcompetencies in policy use and advocacy, many of which involved political and policy items, were rated the lowest. Many respondents indicated that they were not confident, somewhat confident or unsure of these subcompetencies.

A further examination was conducted to explore the similarity in content of subcompetencies that were rated 75% across the various domains. The following themes emerged:

- Political action
- Measurement and monitoring
- Analysis and use of evidence

The specific subcompetencies associated with each theme are identified in Appendix C ([https://files.cdha.ca/profession/Journal/Sunell\\_AppendixC\\_v53n2.pdf](https://files.cdha.ca/profession/Journal/Sunell_AppendixC_v53n2.pdf)). Subcompetencies that included a political context were rated below 75% in terms of the learners' confidence level. The measuring and monitoring theme included

subcompetencies involving quality assurance protocols and the use of cost-benefit and cost utility data. With regard to the analysis and use of evidence, the subcompetencies related to the interpretation and presentation of statistical data, the use of theoretical frameworks, and the incorporation of system thinking.

While the ratings provided important insights into the subcompetencies within the domains, these data were also enriched by the comments from the respondents. For example, students commented on the areas in which they felt confident:

*I feel that we develop strong foundational knowledge of the science and mechanisms behind disease, health, and behaviour, and how to use this knowledge when making clinical decisions.*

*The degree program made me confident that I can do more than be a clinical therapist and use my knowledge in health promotion in all aspects of health care.*

They also wrote about the areas they found more challenging. For example, there was a recognition of advocacy for individuals as reflected in the following quote.

*Advocacy is important. I recognize that I can be an advocate for my clients through referrals and research.*

However, cause advocacy was described as more challenging to grasp.

*Advocacy is something I have struggled with; it is difficult to...change a policy and understand how the political process works.*

*I have come across most of the points [Advocacy subcompetencies] while studying but I am not sure how I may see myself apply them in practice.*

Respondents also provided insights into areas in which they felt less confident as reflected in the following quotes.

*I do not feel very confident critiquing statistical tests and methodologies.*

*We present leadership qualities almost every day with clients in different settings. I am not sure how I/someone else may have applied this to global and political issues.*

*Policy use seems more specific if you're trying to change something in the government; I feel I don't fully understand this still.*

The respondents' written comments helped to clarify their ratings and provide insights into their understanding of CDHA's baccalaureate competencies.

## DISCUSSION

This study explored the self-confidence level of graduating students in a 4-year baccalaureate program to support ongoing curriculum revisions. The confidence level of the graduating students was likely influenced by the fact that they were familiar with the structure and language of competency documents.

The graduating learners appeared to have a strong knowledge of dental hygiene practice with the exception of their understanding of its political aspects. This finding likely reflects the fact that the political arena is complex, as evidenced by the often-tumultuous events noted in the media. This area warrants further exploration during curriculum review initiatives to determine if it reflects a realistic baccalaureate outcome or would be more appropriately positioned within a graduate degree program.

The respondents indicated confidence in many of the core domains such as collaboration, professionalism, coordination, and leadership as well as the dental hygiene services domains including clinical therapy, disease prevention, and oral health education thus affirming the current focus of baccalaureate dental hygiene education. The strong ratings in these dental hygiene services domains were anticipated given that such domains have been integral to dental hygiene education for many years. The solid confidence level of learners in these domains suggest that there may be opportunities to shift some curriculum hours to domains in which the learners expressed less confidence. However, such shifts will need to be carefully monitored to ensure that current confidence levels are maintained.

The domains discussed above are similar to those found in American literature articulating important workforce abilities.<sup>27-31</sup> In a 2013 pilot group study<sup>27</sup> of workforce needs, the American Dental Hygienists' Association recommended the following domains:

- foundation knowledge
- patient-centred care
- management of health care systems
- interprofessional communication
- critical thinking
- professionalism

The supporting discussions focused on the emerging oral and systemic health links that emphasize the need to frame health services from a "whole-person care"<sup>28</sup> perspective.

A concurrent symposium report<sup>29</sup> explored competency domains from the perspective of oral-systemic health competencies and reinforced similar themes including increased depth and breadth of knowledge, and increased professional capacity in communication, coordination,

and research use. These competencies reflect a shift to a population approach including the integration of oral health care into general health across national health care systems.<sup>28-31</sup>

In the health professional literature collaboration and coordination are discussed from the perspective of increased client safety and better health outcomes.<sup>32,33</sup> The Canadian safety competencies<sup>33</sup> developed for all health professions highlight their importance through the following domains: 1) contribute to a culture of patient safety; 2) work in teams for patient safety; and 3) communicate effectively for patient safety.

Respondents expressed the highest confidence in collaboration, which is supported by Kanji and Laronde<sup>34</sup> who found a higher level of collaboration with non-dental health professionals ( $p < 0.001$ ) among UBC baccalaureate graduates when compared to the Canadian respondents in CDHA's 2015 Job Market and Employment Survey. Interprofessional education (IPE) with its emphasis on collaboration has been described as central to health care reform for many years.<sup>28,35-37</sup> It encourages the creation of multilevel and intersectoral approaches to health care. IPE creates T-shaped graduates,<sup>38</sup> who possess a depth of knowledge of their own profession yet are capable of and disposed to explore other fields that may influence the services they provide. The need to work collaboratively has also been highlighted by increased attention to collective competence<sup>38,39</sup> with its focus on interactions among professionals as they share their knowledge, experience, and perceptions to enhance care. It recognizes the need in health care for both competent individuals and competent teams. Bridging the gap between oral health and general health is essential, and dental hygienists have been described as playing an integral role in this regard.<sup>40</sup> The UBC graduates expressed confidence in working with other health professionals.

Other key competencies related to client safety include the subcompetencies within the domains of research use, communication, and advocacy.<sup>41,42</sup> While the ratings for research use and communication were in the 3rd quartile, the policy use and advocacy domains were in the 1st quartile (Table 3). The low ratings for the policy use domain focused on issues of policies, regulations, and legislation including their monitoring and evaluation. The low confidence ratings in the advocacy domain reflect the respondents' low ratings across the domains of the subcompetencies related to political issues and actions. American dental hygiene studies have highlighted the importance of undergraduate advocacy experiences.<sup>43-45</sup> However, alumni continue to need mentorship support to develop these abilities.<sup>43,44</sup> These 4 domains are now central to the UBC dental hygiene program review and revision process.

Leadership abilities are described as being related to the development of advocacy abilities as well as

increasing professional capacity.<sup>46</sup> There has been a growing discussion about the need for fundamental leadership abilities within oral health education.<sup>3,4,10,30,46-48</sup> The importance of leadership in the health professions was emphasized in the Canadian public health competencies<sup>42</sup> and later also reflected in the dental public health competencies<sup>42</sup> given that they are linked to capacity building of the health professions. Smith et al.<sup>46</sup> found that leadership abilities were included in many but not all dental hygiene degree completion programs, with 13 respondents (27%) indicating that their program did not include leadership-infused curriculum. The ratings of the UBC graduating students in this domain were in the 4th quartile (78%). Respondents' written comments identified the complex nature of the domain and its value suggesting that they appear to recognize the importance of such abilities.

Many of the discussions during the Delphi study<sup>3,4</sup> revolved around the boundary in the health promotion, advocacy, and policy use domains between baccalaureate and master's level education. In the case of health promotion, the discussions focused on working with individual clients versus groups and communities with the former being viewed as an outcome of diploma and the latter of baccalaureate education. Similarly, advocacy for individuals was viewed as a diploma outcome, with case advocacy being an additional baccalaureate outcome. The lower ratings in these domains raise questions about the curriculum dedicated to these areas as well as the degree of difficulty of the baccalaureate subcompetencies.

This is also true of the research use domain. Across the domains, respondents expressed less confidence in subcompetencies associated with the analysis and interpretation of evidence. While educators in the United States have developed dental hygiene master's competencies,<sup>49</sup> they have not articulated baccalaureate competencies. Conversely, Canadian educators have baccalaureate competencies but no national competencies for master's education. Are some of the subcompetencies perhaps more reflective of master's education? It would be timely to develop master's level competencies to support a better understanding of the boundaries between baccalaureate and master's education.

The data from this study raise questions about the realistic nature of some of the subcompetencies and suggest that some may reflect intentions rather than outcomes of baccalaureate education. Chambers and Gerrow<sup>50</sup> distinguished between exposure to, experience with, and assessment of competencies in their study. Based on the data from the UBC graduating students it appears that some subcompetencies, particularly those within the advocacy and policy use domains, may fall within the realm of "exposure to and experience with" rather than "assessment of." This finding again highlights the importance of articulating the boundary between

Canadian master's and baccalaureate competencies to ensure that the expectations of dental hygiene baccalaureate education are realistic and align with those of other health professions.

### Limitations

It is challenging to determine the level of confidence ratings realistic for program outcomes given that the measurement of confidence includes some sources of error associated with overconfident and underconfident ratings.<sup>19,25</sup> While there are mixed findings related to the congruence between self-ratings and faculty-assessed competence,<sup>18,19</sup> more recent dental studies<sup>23,25</sup> have found congruence between students' self-ratings and those of educators particularly for graduating students with experience in self-assessment. The findings presented in this study were based on one class of graduating students; other baccalaureate graduates may provide divergent ratings. Despite these limitations, this study provides initial data from which to explore student confidence and competence at graduation. This is the first year of a 3-year study; it is anticipated that the data from 2018 and 2019 graduates, and perhaps data from other Canadian baccalaureate programs will provide additional insights.

### CONCLUSION

The competency areas in which the graduating learners expressed the highest confidence included collaboration, clinical therapy, oral health education, disease prevention, professionalism and integration of knowledge. The areas in which they expressed the least confidence included policy use and advocacy where some respondents were not confident, somewhat confident or unsure.

While supporting program curriculum revisions, the findings also contribute to a broader national discussion about the baccalaureate competencies to explore subcompetencies that may be beyond the scope of baccalaureate education.

The domains in which respondents expressed less confidence reflect the boundary between baccalaureate and master's education. This is a boundary that has yet to be defined in the Canadian context. Graduate outcomes need to be explored from multiple perspectives including undergraduate and postgraduate levels so that dental hygienists can promote and support the oral health of the public in the 21st century.

### ACKNOWLEDGEMENTS

The researchers thank Ms Maire Guest and Ms Siobhan Ryan in UBC's Faculty of Dentistry for their assistance with survey construction and participant recruitment. This study received support from the UBC Faculty of Dentistry S. Wah Leung Endowment Fund for educational research.



**CONFLICTS OF INTEREST**

The authors have declared no conflicts of interest.

**REFERENCES**

- Canadian Dental Hygienists Association (CDHA). *Canadian competencies for baccalaureate dental hygiene programs*. Ottawa (ON): CDHA; 2015 [cited 2018 Oct 12]. Available from: [www.cdha.ca/pdfs/profession/CCBDHP\\_report.pdf](http://www.cdha.ca/pdfs/profession/CCBDHP_report.pdf).
- Canadian Dental Hygienists Association (CDHA), Federation of Dental Hygiene Regulatory Authorities (FDHRA), Commission on Dental Accreditation of Canada (CDAC), National Dental Hygiene Certification Board (NDHCB). *Entry-to-practice competencies and standards for Canadian dental hygienists*. Ottawa (ON): CDHA, FDHRA, CDAC, NDHCB; January 2010 [cited 2018 Oct 12]. Available from: [www.cdha.ca/pdfs/Competencies\\_and\\_Standards.pdf](http://www.cdha.ca/pdfs/Competencies_and_Standards.pdf).
- Sunell S, Asadoorian J, Gadbury-Amyot CC, Biggar HC. Competencies for Canadian baccalaureate dental hygiene education—a Delphi study—part 1. *Can J Dent Hyg*. 2015;49(2):57–73.
- Sunell S, Asadoorian J, Gadbury-Amyot CC, Biggar HC. Competencies for Canadian baccalaureate dental hygiene education—a Delphi study—part 2. *Can J Dent Hyg*. 2015;49(3):101–114.
- Sunell S, Richardson F, Udahl B, Jamieson L, Landry D. National competencies for dental hygiene entry-to-practice. *Can J Dent Hyg*. 2007;42(1):27–36.
- Verma S, Paterson M, Medves J. Core competencies for health care professionals: What medicine, nursing, occupational therapy and physiotherapy share. *J Allied Health*. 2006;35(2):109–15.
- Verma S, Broers T, Paterson M, Schroder C, Medves JM, Morrison C. Core competencies: The next generation. *J Allied Health*. 2009;38(1):47–53.
- University of British Columbia. *UBC dental hygiene program competencies document—Version 1.3*. Vancouver (BC): UBC; 2009.
- Crooks D, Carpio B, Brown B, Black M, O'Mara L, Noesgaard C. Development of professional confidence by post diploma baccalaureate nursing students. *Nurse Educ Pract*. 2005;5(6):360–67.
- Mirzakhani K, Shorab NJ. Study of the self-confidence of midwifery graduates from Mashhad College of nursing and midwifery in fulfilling clinical skills. *Ephysician*. 2015;7(5):1284–289.
- Honey J, Lynch CD, Burke FM, Gilmour ASM. Ready for practice? A study of confidence levels of final-year dental students at Cardiff University and University College Cork. *Eur J Dent Educ*. 2011;15(2):98–103.
- Holland K, Middleton L, Uys L. Professional confidence: a concept analysis. *Scand J Occup Ther*. 2012;19(2):214–24.
- White KA. Self-confidence: a concept analysis. *Nursing Forum*. 2009;44(2):103–114.
- Hecimovich MD, Volet SE. Importance of building confidence in patient communication and clinical skills among chiropractic students. *J Chiropr Educ*. 2009;23(2):151–64.
- Kukulu K, Korukcu O, Ozdemir Y, Bezci A, Calik C. Self-confidence, gender and academic achievement of undergraduate nursing students. *J Psychiatr Ment Health Nurs*. 2013;20(4):330–35.
- Lukewich J, Edge DS, Tramer J, Raymond J, Miron J, Ginsburg L, VanDenKerkof E. Undergraduate baccalaureate nursing students' self-reported confidence in learning about patient safety in the classroom and clinical settings: an annual cross-sectional study (2010–2013). *J Nurs Stud*. 2015;52(5):930–38.
- Ohde S, Deshpande GA, Takahashi O, Fukui T. Differences in residents' self-reported confidence and case experience between two post-graduate rotation curricula: Results of a nationwide survey in Japan. *BMC Med Educ*. 2014;14:141.
- Alexander KM, Olsen J, Seiger C, Peterson TS. Student physical therapists' competence and self-confidence in basic clinical assessment and musculoskeletal differential diagnosis. *J Allied Health*. 2016;45(2):95–100.
- Davis DA, Mazmanian PE, Fordis M, Harrison RV, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared to observed measures of competence. *JAMA*. 2006;296(9):1094–1102.
- Whitney EM, Walton JN, Aleksejuniene J, Schönwetter DJ. Graduating dental students' views of competency statements: importance, confidence and time trends from 2008 to 2012. *J Dent Educ*. 2015;79(3):322–30.
- Claiborne DM. Dental hygiene students' clinical self-confidence and management of pediatric clients: pilot study. *Can J Dent Hyg*. 2019;53(1):43–52.
- Molteni VE, Chan EK. Student confidence/overconfidence in the research process. *J Acad Librariansh*. 2015;41(1):2–8.
- McFarlan KK, Nayar P, Ojha D, Chandak A, Gupta N. Impact of community-based dental education on attainment of ADEA competencies: student's self-ratings. *J Dent Educ*. 2016;80(6):670–76.
- Metz MJ, Durski MT, DeGaris MO, Daugherty TC, Vaught RL, Cornelius CJ, Mayfield TG. Student self-assessment of operative dentistry experiences: A time-dependent exercise in self-directed learning. *J Dent Educ*. 2017;81(5):571–81.
- Kleitman S, Stankov L. Self-confidence and metacognitive processes. *Learn Individ Differ*. 2007;17:161–73.
- Gadbury-Amyot CC, Woldt JL, Siruta-Austin KJ. Self-assessment: A review of the literature and pedagogical strategies for its promotion in dental education. *J Dent Hyg*. 2015;89(6):357–64.
- American Dental Hygienists' Association. *Transforming dental hygiene education and the profession for the 21st century*. Chicago (IL): ADHA; 2013 [cited 2015 Nov 25]. Available from: <http://tenndha.com/wp-content/uploads/2015/10/ADHA-White-Paper.pdf>
- Atchison KA, Rozier RG, Weintraub JA. Integration of oral health and primary care: Communication, coordination and referral [discussion paper]. *NAM Perspectives*. Washington (DC): National Academy of Medicine; October 2018 [cited 2017 Nov 1]. Available from: <https://nam.edu/wp-content/uploads/2018/10/Integration-of-Oral-Health-and-Primary-Care.pdf>
- US Department of Health and Human Services, Health Resources and Services Administration. *Transforming dental hygiene education, proud past, unlimited future: Proceedings of a symposium*. Rockville (MD): US Department of Health and Human Services; 2014 [cited 2015 Nov 25]. Available from: [www.hrsa.gov/publichealth/clinical/oralhealth/transformingdentalhygiene.pdf](http://www.hrsa.gov/publichealth/clinical/oralhealth/transformingdentalhygiene.pdf)
- Fried JL, Maxey HL, Battani K, Gurenlian JR, Byrd TO, Brunick A. Preparing the future dental hygiene workforce: knowledge, skills, and reform. *J Dent Educ*. 2017;81(Suppl 9):eS45–eS52.

31. Theile CW. Strengths and weaknesses of the current dental hygiene educational system. *J Dent Educ.* 2017;81(Suppl 9): eS38–eS45.
32. Andermann A, Ginsburg L, Norton P, Arora N, Bates D, Wu A, Larizgoitia I. Core competencies for patient safety research: a cornerstone for global capacity strengthening on behalf of the Patient Safety, Research Training and Education Expert Working Group of WHO Patient Safety. *BMJ Quality & Safety.* 2011;20:96–101.
33. Frank JR, Brien S (editors), on behalf of The Safety Competencies Steering Committee. The safety competencies: *Enhancing patient safety across the health professions.* Ottawa (ON): Canadian Patient Safety Institute; 2008 [cited 2017 June 4]. Available from: [www.patientsafetyinstitute.ca/en/toolsResources/safetyCompetencies/Pages/default.aspx](http://www.patientsafetyinstitute.ca/en/toolsResources/safetyCompetencies/Pages/default.aspx).
34. Kanji Z, Laronde DM. Career outcomes of dental hygiene baccalaureate education: A study of graduates' professional opportunities, further education, and job satisfaction. *J Dent Educ.* 2018;82(8):809–18. doi: 10.21815/JDE.018.075.
35. Public Health Agency of Canada (PHAC), Canadian Public Health Association (CPHA). *Moving ahead, together—Launch of a national dialogue on public health and sustainable development in Canada: workshop summary report.* Ottawa (ON): PHAC; 2007 [cited 2017 July 30]. Available from: [www.phac-aspc.gc.ca/publicat/sds-sdd/pdf/sds-sdd2\\_e.pdf](http://www.phac-aspc.gc.ca/publicat/sds-sdd/pdf/sds-sdd2_e.pdf)
36. Frantz JM, Rhoda AJ. Implementing interprofessional education and practice: Lessons from a resource-constrained university. *J Interprof Care.* 2017;31(2):180–83.
37. Kanji Z, Lin S, Krekoski C. Interprofessional education and collaborative practice. *Can J Dent Hyg.* 2017;51(1):42–48.
38. Franqueriro T, King M, Brown D. Transforming the workforce from individual to collective competence. *J Contin Educ Nurs.* 2017;48(10):440–41.
39. Epstein I, Peisachovich E, Da Silva C, Lee C, Solomon P. Medical aesthetics training: Shifting to collective competence. *Plast Surg Nurs.* 2017;37(3):103–108.
40. Wakabayashi H. Medical-dental collaboration in general and family medicine. *J Gen Fam Med.* 2019;20(2):47.
41. Canadian Association of Public Health Dentistry (CAPHD). *Discipline competencies for dental public health.* Edmonton (AB): CAPHD; 2008 [cited 2014 May 24]. Available from: [www.caphd.ca/sites/default/files/pdf/DisciplineCompetenciesVersion4\\_March31.pdf](http://www.caphd.ca/sites/default/files/pdf/DisciplineCompetenciesVersion4_March31.pdf)
42. Public Health Agency of Canada (PHAC). *Core competencies for public health in Canada: release 1.0.* Ottawa: PHAC; 2008 [cited 2016 Nov 26]. Available from: [www.phac-aspc.gc.ca/php-psp/ccph-cesp/about\\_cc-apropos\\_ce-eng.php](http://www.phac-aspc.gc.ca/php-psp/ccph-cesp/about_cc-apropos_ce-eng.php)
43. Rogo EJ, Bono LK, Peterson T. Developing dental hygiene students as future leaders in legislative advocacy. *J Dent Educ.* 2014;78(4):541–51.
44. Bono LK, Rogo EJ, Hodges K, Frantz AC. Post-graduation effects of an advocacy engagement project on alumni of a dental hygiene program. *J Dent Educ.* 2018;82(2):118–29.
45. Juhl JA, Stedman L. Advocacy for the provision of dental hygiene services within the hospital setting: development of a dental hygiene student rotation. *J Evid Base Dent Pract.* 2016;16 Suppl:129–35.
46. Smith ML, Gurenlian JR, Freudenthal JJ, Farnsworth TJ. Leadership in dental hygiene degree completion programs: A pilot study comparing stand-alone leadership courses and leadership-infused curricula. *J Dent Educ.* 2015;80(5):595–604.
47. Portillo KM, Rogo EJ, Calley KH, Cellucci LW. A survey of degree completion programs in dental hygiene education. *J Dent Educ.* 2013;77(5):554–63.
48. Taichman RS, Parkinson JW, Nelson BA, Nordquist B, Ferguson-Young DC, Thompson JF. Leadership training for oral health professionals: a call to action. *J Dent Educ.* 2012;76(2):185–90.
49. American Dental Educators Association, American Dental Hygienists' Association. *Core competencies for graduate dental hygiene education.* Chicago: Authors; 2011 [cited 2012 Sept 12]. Available from: [www.adea.org/uploadedFiles/ADEA/Content\\_Conversion\\_Final/about\\_adea/governance/ADEA\\_Core\\_Competencies\\_for\\_Graduate\\_Dental\\_Hygiene\\_Education.pdf](http://www.adea.org/uploadedFiles/ADEA/Content_Conversion_Final/about_adea/governance/ADEA_Core_Competencies_for_Graduate_Dental_Hygiene_Education.pdf)
50. Chambers DW, Gerrow JD. Manual for developing and formatting competency statements. *J Dent Educ.* 1994;58(5):361–66.