

Perceived Competency at Graduation Among Dental Alumni of the University of the West Indies

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Abstract: The aims of this study were to describe levels of self-rated competency of dental graduates from the University of the West Indies (UWI) and to investigate relationships with gender and the effect of curriculum change. A thirty-two item self-reported postal questionnaire was sent to UWI dental alumni (1994-2002). The questionnaire included twenty-eight competencies that could be rated on a 5-point scale: 1 (not at all competent) to 5 (very competent). Overall preparedness for practice could also be rated from 1 (not at all prepared) to 5 (very prepared). The response rate was 77.4 percent, with a mean age of 29.3 years. Items with the highest mean scores were taking an adequate medical history (4.49), recognizing and treating dental caries (4.46), oral examination (4.36), and giving dental health education (4.35). Those with the lowest rating were designing and undertaking clinical research (2.29), dealing with practice management issues (2.52), designing and delivering crown and bridge work (3.33), and recognizing pathologic occlusions (3.33). Overall preparedness for practice was rated as 3.27. Female graduates rated four competencies significantly higher than males. Graduates exposed to the new curriculum perceived greater overall preparedness for general dental practice, suggesting the change to a competency-based curriculum was effective.

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Key words: competency, alumni, dental curriculum, education, West Indies

Submitted for publication 9/5/03; accepted 11/11/03

To be competent is defined as having the necessary skill or knowledge to do something successfully.¹ For the dental graduate this has been described as the necessary “skills, understanding and professional values of an individual ready for beginning independent dental or allied oral health care practice.”²

Furthermore, the aim of undergraduate dental education has been described as “to produce a caring, knowledgeable, competent and skilful dentist who is able, on graduation, to accept professional responsibility for the effective and safe care of patients, who appreciates the need for continuing professional development, who is able to utilise advances in relevant knowledge and techniques, and who understands the role of the patient in decision making.”³

Until relatively recently, traditional methods of dental education have typically utilized didactic, individual discipline-based curricula to teach students increments of prescribed subject matter.^{4,5} The effectiveness of these methods in developing graduates with a wide range of dental competencies has been questioned. For example, research on dental graduates regarding their level of preparedness/competency at time of graduation has shown that although most graduates feel prepared overall for general practice, they tend to be more confident in areas of restorative and preventive dentistry rather than removable prosthetics, myofacial pain, biopsies, practice management, communication, and teamworking skills.⁶⁻⁸ Development of dental curricula may therefore require focusing more on desired learning outcomes and the core competencies expected at gradu-

ation, particularly as the shift toward evidence-based dentistry continues and the dentist's role changes from a highly skilled technician toward an oral health care physician and team leader.⁵

The University of the West Indies (UWI) School of Dentistry in Trinidad is the only dental school in the English-speaking Caribbean and accepts students from within the region and internationally.⁹ The school graduated its first dentists in 1994 and has 124 graduates up to 2002, with sixty-seven males (54 percent) and fifty-seven females (46 percent).¹⁰ The school currently runs a five-year undergraduate program with basic sciences being taught in years 1 and 2 using a problem-based learning (PBL) system and clinical teaching in years 3, 4, and 5. In 1999, clinical teaching moved toward a more integrated competency approach in which the ability to manage total patient care was one of the main desired outcomes.

Central to the curriculum change was the statement of "Competencies of a New Dentist" that identified six essential competencies that represent the "broad categories for the effective and safe practice of general dentistry in a community."¹¹ These categories are professionalism; assessment of a patient's treatment needs; establishment and maintenance of oral health; restoration of form, function, and aesthetics; health promotion; and dental practice management. Under these categories a list of more specific learning objectives allows for issues of training and evaluation. These essential competencies are not specific to departments and rely on interdisciplinary teaching "as opposed to poorly sequenced, department based piles of information each having its own tuition, methods, syllabus and assessments."¹¹

Although the curricular development described here is in keeping with current educational recommendations,¹² the UWI competency document itself states it is "living, dynamic and responsive to change . . . requiring regular review for currency and continued improvement." In 2003, a visiting team comprised of dental clinical academics from the United States, United Kingdom, and the Caribbean reviewed the UWI School of Dentistry's curriculum as part of a teaching quality assurance audit. A team member commented that overall they "were satisfied that the students would graduate with the skills for diagnosis, treatment planning and operative treatment comparable to similar international undergraduate dental schools" and "were pleased that there are positive moves towards a competency-based assessment procedure."¹³

Although these views are encouraging, the effectiveness of the new competency-based curriculum in preparing graduates for clinical practice has not been evaluated. Several methods exist for assessing the effectiveness of dental programs. One method widely used has been alumni self-perception of their training and competence.¹⁴

The aims of this study were:

- to describe levels of self-rated competency of dental graduates from the University of the West Indies;
- to investigate relationships between self-rated competency and gender; and
- to compare self-rated competency at time of graduation between graduates of the "old" and "new" curriculum.

Method

A thirty-two item self-reported postal questionnaire was sent to all alumni for whom contact details were available (this included graduates practicing in the Caribbean region and internationally). A cover letter was sent with the questionnaire explaining the purpose of the study, inviting participation, and indicating that data would be analyzed and presented anonymously. A second mailing was sent to non-responders, along with telephone or email reminders in order to achieve an acceptable response rate. Data collection took place between January and March 2003.

The questionnaire, which was adapted from one previously used,⁷ included twenty-eight competency items that could be rated on a 5-point scale: 1 (not at all competent) to 5 (very competent). Items covered areas related to diagnostics, clinical skills, patient management, teamworking, and practice management. "Overall preparedness for practice" could also be rated from 1 (not at all prepared) to 5 (very prepared).

Information was also recorded on year of graduation, gender, present type of practice, and post-graduate qualifications. The questionnaire was pre-tested on part-time clinical staff members of the UWI School of Dentistry who were not UWI dental graduates. Data were processed using Microsoft Excel and analyzed using SPSS version 10. Differences between group means were analyzed using students t-test.

Results

At the time of the survey, there were 124 graduates of the University of the West Indies School of Dentistry from the first graduating class of 1994 up to 2002. Of these graduates, contact details were unavailable for eight, and one was excluded due to being part of the research group undertaking the study. This resulted in an accessible target population of 115 graduates. Of the 115 graduates contacted, eighty-nine returned a completed questionnaire, resulting in a response rate of 77.4 percent.

The mean age of respondents was 29.3 years, with a range of twenty-four to forty-six years. Fifty-four (60.7 percent) were male, and thirty-five (39.3 percent) female. Sixteen respondents (18 percent) had further post-D.D.S. dental or medical qualifications (MBBS). The majority of respondents (61.8 percent) reported their main area of practice was general prac-

tice; 30.3 percent were hospital- or health center-based with a smaller number in a teaching institution (7.9 percent).

Table 1 shows the mean scores for self-rated competency for the twenty-eight items in the questionnaire, listed from highest to lowest rating. The five items with the highest mean scores were taking an adequate medical history (4.49), recognizing and treating dental caries (4.46), oral examination (4.36), giving dental health education (4.35), and recognizing the need for referral (4.33). Those with the lowest rating were designing and undertaking clinical research (2.29), dealing with practice management issues (2.52), designing and delivering crown and bridge work (3.33), recognizing pathologic occlusions (3.33), and managing medical emergencies (3.37). Overall preparedness for practice was rated as 3.27. Over half the respondents (55.1 percent) felt reasonably well prepared for practice, and 34.8 percent felt very well or extremely well prepared.

Table 1. Self-rated competency at time of graduation for all respondents (n=89)

Competency Item	mean	sd
Take an adequate medical and oral health history	4.49	0.64
Recognize and treat dental caries	4.46	0.58
Thoroughly examine the oral cavity and related structures	4.36	0.66
Give dental health education to a patient	4.35	0.69
Recognize the need for referral/specialist consultation	4.33	0.70
Implement infection control policies and procedures	4.27	0.69
Develop a comprehensive and sequential treatment plan	4.16	0.78
Take and interpret dental radiographs	4.13	0.66
Control the patient's pain	4.13	0.71
Manage dental emergencies	4.09	0.70
Explain/advise the patient on best treatment options	4.07	0.85
Recognize and treat periodontal conditions	4.00	0.74
Treat endodontic conditions and their sequelae	3.98	0.72
Treat oral infections	3.97	0.82
Function with auxiliary personnel effectively	3.84	0.89
Recognize pathologic/potentially pathologic oral lesions	3.80	0.79
Critically evaluate treatment being delivered/modify a treatment plan	3.80	0.84
Manage dentally anxious patients	3.75	0.92
Design and deliver complete dentures	3.62	0.91
Recognize and treat iatrogenic restorative conditions	3.61	0.73
Design and deliver removable partial dentures	3.57	0.93
Recognize myofacial pain/TMJ dysfunction	3.52	1.02
Manage medical emergencies	3.37	0.96
Recognize pathologic occlusions	3.33	1.07
Design and deliver crown/bridgework	3.33	0.88
Overall preparedness for general dental practice	3.27	0.67
Deal with practice management issues	2.52	1.16
Design and undertake clinical research	2.29	0.98

Table 2 shows the mean self-rated competency for males and females. Significant differences were found between genders on four of the competencies: recognize the need for referral/specialist consultation; give dental health education; critically evaluate treatment being delivered/modify treatment plan; and design and undertake clinical research.

Table 3 shows the competencies where significant differences were found between dentists graduating 1994-99 and those who graduated in 2000-02. The class of 2000 were the first UWI graduates to have some exposure to the new curriculum during their clinical training. Significant differences were found on twelve competencies. These competencies were rated significantly higher by graduates of the new curriculum.

Discussion

Various methods for assessing the effectiveness of curricula have been used, such as competency examinations, board examinations, clinical output, instructor evaluations, and student, alumni, and patient satisfaction surveys.¹⁴ In this study an alumni survey was used as it was felt it could provide information on the strengths and weakness of the curriculum, the effect of curriculum change, and practice patterns of the graduates.⁷

The results of this study have many similarities to previous surveys of dental alumni; however, some findings provide new insights relevant to the issue of curriculum development based on profes-

Table 2. Self-rated competency by gender

Competency Item	Male (n=54)		Female (n=35)	
	mean	(sd)	mean	(sd)
Take an adequate medical and oral health history	4.43	(0.69)	4.60	(0.55)
Recognize and treat dental caries	4.43	(0.57)	4.51	(0.61)
Thoroughly examine the oral cavity and related structures	4.28	(0.68)	4.49	(0.61)
Give dental health education to a patient*	4.22	(0.74)	4.54	(0.56)
Recognize the need for referral/specialist consultation*	4.20	(0.71)	4.51	(0.66)
Implement infection control policies and procedures	4.17	(0.72)	4.43	(0.61)
Develop a comprehensive and sequential treatment plan	4.11	(0.77)	4.23	(0.81)
Take and interpret dental radiographs	4.17	(0.61)	4.09	(0.74)
Control the patient's pain	4.19	(0.73)	4.06	(0.68)
Manage dental emergencies	4.11	(0.69)	4.06	(0.73)
Explain/advise the patient on best treatment options	4.00	(0.87)	4.17	(0.82)
Recognize and treat periodontal conditions	3.94	(0.76)	4.09	(0.70)
Treat endodontic conditions and their sequelae	4.06	(0.66)	3.86	(0.81)
Treat oral infections	3.93	(0.84)	4.03	(0.79)
Function with auxiliary personnel effectively	3.80	(0.92)	3.91	(0.85)
Recognize pathologic/potentially pathologic oral lesions	3.76	(0.80)	3.86	(0.77)
Critically evaluate treatment being delivered/modify treatment plan*	3.65	(0.85)	4.03	(0.79)
Manage dentally anxious patients	3.69	(0.89)	3.86	(0.97)
Design and deliver complete dentures	3.76	(0.89)	3.40	(0.91)
Recognize and treat iatrogenic restorative conditions	3.57	(0.72)	3.66	(0.76)
Design and deliver removable partial dentures	3.56	(0.96)	3.60	(0.88)
Recognize myofacial pain/TMJ dysfunction	3.44	(1.06)	3.63	(0.97)
Manage medical emergencies	3.48	(0.97)	3.20	(0.93)
Recognize pathologic occlusions	3.17	(1.13)	3.57	(0.95)
Design and deliver crown/bridgework	3.43	(0.90)	3.17	(0.82)
Overall preparedness for general dental practice	3.19	(0.65)	3.40	(0.69)
Deal with practice management issues	2.48	(1.18)	2.57	(1.14)
Design and undertake clinical research*	2.09	(0.85)	2.60	(1.09)

*Significant differences between male and female graduates (t-test, $p < 0.05$).

Table 3. Competency items showing significant differences for graduates of old curriculum (1994-99) and new curriculum (2000-02)

Competency Item	Graduates 1994-99 (n=48)		Graduates 2000-02 (n=41)	
	mean	(sd)	mean	(sd)
Thoroughly examine the oral cavity and related structures*	4.21	(0.71)	4.54	(0.55)
Treat oral infections*	3.81	(0.94)	4.15	(0.61)
Design and deliver complete dentures*	3.42	(1.01)	3.85	(0.73)
Recognise the need for referral/specialist consultation*	4.17	(0.78)	4.51	(0.55)
Develop a comprehensive and sequential treatment plan*	3.98	(0.84)	4.37	(0.66)
Design and deliver removable partial denture*	3.35	(1.02)	3.83	(0.74)
Overall preparedness for general dental practice*	3.10	(0.69)	3.46	(0.60)
Design and undertake clinical research†	2.02	(1.30)	2.61	(0.97)
Critically evaluate treatment being delivered/ modify a treatment plan†	3.54	(0.94)	4.10	(0.58)
Control the patient's pain†	3.92	(0.77)	4.39	(0.54)
Recognize pathologic occlusion†	2.98	(1.16)	3.73	(0.81)
Explain/advise the patient on best treatment options†	3.79	(0.94)	4.39	(0.59)

t-test, * $p < 0.05$; † $p < 0.01$

sional competencies. Although this research focussed on specific competency items, it is important that these “competencies” are not seen as individual elements, but as an integral whole making up the entity of “clinical competency”—evidence of which must be demonstrated before graduation and entry to the profession. Clinical competency may be defined as the behavior expected of beginning independent practitioners. This behavior should incorporate understanding, skills, and values as an integrated response to the full range of circumstances encountered in professional practice. Furthermore, the appropriate level of clinical competence must be established for both teaching and assessment.

Benner¹⁵ identifies five levels of competence. The *novice* has no experience of the situation in which he or she is expected to perform and is simply taught rules. This “rule-governed” behavior tends to be extremely limited and inflexible. Thus a dental student may be technically competent to perform a simple restoration, but be a novice at the clinical application of such skill and the associated professional responsibilities. The *advanced beginner* is starting to formulate principles to guide actions based on limited experience, but these will usually have to be informed by reference to a tutor or mentor. The *clinically competent* practitioner begins to see his or her actions in terms of long-range goals or plans based on considerable conscious, abstract, analytical contemplation of the problem. He or she lacks the speed and efficiency of the proficient and does not have

sufficient experience to recognize a situation in terms of the overall picture. This is the level required for satisfactory completion of the undergraduate dental program. The *proficient* perceives situations as wholes rather than chopped-up parts and has learned from experience what typical events to expect in a given situation and how plans need to be modified in response to these events. Finally, the *expert*, with an enormous background of experience, has an intuitive grasp of each situation and performs with a highly skilled analytic ability for those times when events do not occur as expected.

Although in our study graduates were not asked about preferred methods of learning, “learning styles” may influence the outcomes of educational programs. Categories of learner such as those in the Sensory Model include visual, auditory, and kinesthetic. Visual learners learn primarily through written information, diagrams, and pictures. Auditory learners relate most effectively to verbal lectures and discussion. Kinesthetic learners learn best through a tactile hands-on approach. Kolb’s learning cycle describes four types of learners: *activists* who enjoy learning through teamwork, *reflectors* who prefer to think and observe before taking action, *theorists* who prefer learning concepts and abstract ideas, and *pragmatists* who prefer direct work experience.¹⁶

Dental students as adult learners have been shown to be self-directed, goal-oriented, and practical problem-solvers, preferring problem-based and case-based learning over traditional models.¹⁶ Prob-

lem-based learning (PBL) is thought to influence dental competencies as it encourages student-centered learning, teamwork, and critical self-evaluation.⁴ Problem-based and case-based learning were introduced in the UWI dental school for the clinical years (years 3, 4, and 5) as part of the new competency-based curriculum.

The response rate to this study was 77.4 percent and represents all nine graduating classes from the UWI School of Dentistry; this rate is higher than other surveys of dental alumni conducted in the United States^{6,7,17} (63 percent, 56 percent, and 46 percent, respectively), France (45 percent),¹⁸ and the UK (63 percent).¹⁹

The proportion of male and female respondents (60.4 percent and 39.3 percent, respectively) is consistent with the overall distribution of male to female graduates (54 percent and 46 percent, respectively). Recent matriculation trends at UWI show higher proportions of females,¹⁰ but this is yet to be reflected in higher numbers of female graduates overall. Eighteen percent of alumni had completed postgraduate qualifications. Most of the respondents were working in general dental practice, with a few in teaching institutions. This suggests that employment opportunities for UWI dental alumni are on par with other dental school graduates.^{7,20} Furthermore, almost one-third were in hospital or health center-based posts, which differs from UWI medical alumni of whom very few remained in the public sector.²¹

Self-Rated Competency

The graduates felt most competent in taking an adequate medical history, recognizing and treating dental caries, conducting an oral examination, giving dental health education, and recognizing the need for referral. Graduates in the United States felt similarly most competent in the same areas,⁷ in particular the areas of restorative and preventive dentistry.⁶ Graduates from Australian,⁸ French,¹⁸ and UK¹⁹ dental schools also felt well prepared for diagnosis and basic restorative dentistry, areas traditionally emphasised in dental curricula.

UWI graduates felt least competent in designing and undertaking clinical research, dealing with practice management issues, designing and delivering crown and bridge work, recognizing pathologic occlusions, and managing medical emergencies, again consistent with findings from the United States^{6,7,17} and France,¹⁸ where 89 percent and 65 per-

cent, respectively, of graduates felt poorly prepared in the areas of practice administration and managing emergencies respectively. The UWI curriculum may need to be adjusted to address these areas of concern.

Graduates of this study gave lower competency ratings for designing and delivering fixed crown and bridgework than for designing and delivering complete and partial removable dentures. This is consistent with findings from France¹⁸ and the UK, where less than a quarter of new graduates felt they had sufficient experience in bridgework,¹⁹ but is in contrast with the United States where graduates felt more competent in fixed than removable prosthodontics.^{6,7}

One possible explanation for this difference may be that the crown and bridge course is presently given in Year 4 semester I at UWI and this leaves only three semesters for clinical training. It may be more prudent to deliver the course at the beginning of Year 3 as this will allow for greater clinical exposure in treating patients with fixed prostheses. Another explanation could be that patients at the UWI dental school have to pay for treatment, and many patients who have dental problems suitable for crown and bridge work may find the cost prohibitive compared to removable prosthetics, resulting in students' having greater clinical exposure to the latter.

Preparedness for Practice and Gender Differences

More than half of the respondents felt reasonably prepared for general dental practice, and over one-third scored 4 or above, which suggests a high level of perceived competence. This is similar to findings from the United States and France where over 60 percent of graduates felt prepared for practice.^{7,18}

There were several items where a significant difference was observed between the genders. Female graduates felt more competent than the male graduates in four items: recognize the need for referral/specialist consultation, give dental health education, critically evaluate treatment being delivered/modify treatment plan, and design and undertake clinical research. Interestingly, these findings suggest that female students feel more competent in some of the areas that represent problem-solving and critical thinking despite the fact that previous research reported female students in the UWI dental school find issues of academic and clinical work more stressful than do male students.²²

Effect of Curriculum Change

The UWI School of Dentistry introduced a competency-based curriculum in 1999. The twenty-eight items on the questionnaire were based on some of the competencies identified in the curriculum document¹¹ as being necessary to enable the new dentist to enter general dental practice as safe, independent oral health care practitioners. Almost half the respondents had some or all of their clinical training under the new curriculum, so this enabled the comparison. Significant differences were observed between graduates of the “old curriculum” (1994-99) and those exposed to the “new competency-based curriculum” (2000-02) for several of the items on the questionnaire.

Items such as thoroughly examine the oral cavity and related structures, recognize the need for referral/specialist consultation, develop a comprehensive and sequential treatment plan, explain/advice the patient on best treatment, and critically evaluate treatment being delivered had significantly higher competency ratings among the newer graduates. These items relate to diagnostic and decisionmaking skills that can be considered as the foundations for good clinical practice. The specific competency in this area was stated as “a new dentist must be able to derive a provisional, differential or definitive diagnosis by interpreting and correlating findings from the history and clinical examination as well as other diagnostic tests.”¹¹ These findings may therefore reflect the integrated nature of the present course where students regularly present and discuss their cases with multidisciplinary clinical teams within the faculty.

Graduates from the new curriculum also felt more competent to treat oral infections and control the patient’s pain. One of the most significant changes from the old curriculum was the restructuring of the separately taught disciplines of oral surgery, oral pathology, oral medicine, and oral radiology, into a combined course (Oral Diseases). The UWI competency document states that “the new dentist must be able to manage pain, discomfort, anxiety associated with orofacial disease or professional care in patients of all ages.”¹¹ Clinical sessions in oral diseases allow students to manage patients presenting in pain or as an emergency in a primary care unit, and students now have the opportunity to interact simultaneously with several staff from the previously mentioned specialties.

Graduates of the new curriculum felt more competent in their ability to design and deliver both

complete and partial removable dentures. An increase in available clinic time for students in the new curriculum (treatment on patients now begins at the start of Year 3 as opposed to Year 4) may provide students with greater exposure to removable prosthetics, which requires careful treatment planning and continuous interaction with clinical and laboratory staff during treatment and follow-up.

Interestingly, students from the new curriculum felt better able to recognize pathologic occlusions, a competency that has received consistently low ratings in several studies.^{6,7,17} A hands-on course on occlusion was included in the new curriculum as part of the crown and bridge course (including occlusal theory, diagnosis, and use of articulators).

The competency ratings by 2000-02 graduates were higher for undertaking and designing clinical research. Increased exposure to critical appraisal of literature and evidence-based dentistry and greater involvement in research projects with faculty, staff, and interns may have raised their competency. However, the mean rating was still less than 3 and suggests that further curricular adjustments are needed to develop this competency—for example, more formal research skills training and undertaking of their own research project.

One of the limitations of this type of survey is that the alumni were asked to recall and rate their perceived level of competency at the time of graduation. If the length of time from graduation to collection of data is long, this may bias their response. It has been recommended that alumni surveys should be limited to graduates of the past ten years,¹⁴ and this was achieved. The response rate in this survey was high, but the perceived levels of competence from nonresponders may be different. Some caution should be applied when comparing the findings of this study to those of other schools as dental curricula vary in length, course content, and teaching methodologies. For example, most schools in the United States have four-year programs as opposed to the five years in Trinidad and the UK. However the desired learning outcomes in these programs (for example, preparedness for general dental practice) are generally consistent internationally.¹²

An important finding was that overall preparedness for general dental practice was higher for students exposed to the competency-based curriculum. Since the majority of new graduates enter general dental practice, this suggests the change to a competency-based curriculum was appropriate.

Alumni surveys are only one method of evaluating the curriculum, but ideally, other methods of curriculum assessment such as clinical output, board examinations, and instructor, patient, and employer surveys should be used to obtain a comprehensive view of the effectiveness of the UWI dental curriculum.

Conclusion

The assessment and evaluation of a curriculum are as important an exercise as the assessment and evaluation of the students undertaking it. It is necessary to validate the outcomes, to confirm that graduates are comparable with those of other institutions whose outcomes have been reported in the literature, and to use as part of curriculum development. No curriculum can remain static. Continuous quality control monitoring is essential for ongoing development.

This research found that UWI graduates perceived themselves well prepared for most aspects of dental practice and highlighted areas requiring further curricular development. The competencies and supporting learning objectives identified in the UWI document "Competencies of a new dentist,"¹¹ toward which the teaching under the new curriculum was specifically directed, have indeed led to practitioners' reporting higher perceived competency and preparedness for practice at graduation. Such reinforcement is valuable in boosting staff morale and encouraging further curriculum development and is likely to raise the confidence of prospective employers of graduates of the UWI School of Dentistry.

Acknowledgments

The authors would like to thank all the UWI dental alumni who participated in this study and Miss Isabelle La Roche for her administrative assistance.

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