Predictors of Academic Performance for Applicants to an International Dental Studies Program in the United States


Abstract: The number of U.S. and Canadian dental schools offering programs for dentists with degrees from other countries leading to the D.D.S. or D.M.D. degree has increased recently. This fact, along with the diversity of educational systems represented by candidates for these programs, increases the importance of identifying valid admissions predictors of success in international dental student programs. Data from 148 students accepted into the international dental studies program at the University of the Pacific from 1994 through 2004 were analyzed. Dependent variables were comprehensive cumulative GPA at the end of both the first and second years of the two-year program. The Test of English as a Foreign Language (TOEFL) and both Parts I and II of the National Board Dental Examination (NBDE) were significant positive predictors of success. Performance on laboratory tests of clinical skill in operative dentistry and in fixed prosthodontics and ratings from interviewers were not predictive of overall success in the program. Although this study confirms the predictive value of written tests such as the TOEFL and NBDE, it also contributes to the literature documenting inconsistent results regarding other types of predictors. It may be the case that characteristics of individual programs or features of the applicant pools for each may require use of admissions predictors that are unique to schools.

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Foreign-educated dental graduates are seeking licensure to practice dentistry in the United States in substantial numbers.1,2 From the beginning of this influx, dental educators and practitioners have been committed to ensuring that these candidates possess the knowledge and skills necessary to complete the programs for which they are selected. Due to the diversity of methods for teaching dentistry around the world2,3 and the shortfalls of qualifying examinations, an increasing number of states are requiring that, to become licensed, foreign-trained dentists must complete a program at a U.S. dental school leading to the D.D.S. or D.M.D. degree.

Even before this expansion in requirements, a number of U.S. and Canadian dental schools had established programs for foreign-trained dental graduates. Today, their number has increased substantially, and the programs are known under many different names even though they have the same purpose.4 The number of applicants to these programs has always been greater than the available openings, which has led to highly competitive admissions processes. Consequently, it becomes important to identify the most valid criteria for selecting the best-suited candidates. Although this selection process seems to have much in common with the admissions process for applicants to predoctoral dental programs, many aspects make the two different. Among these differences are the facts that the academic records of international applicants are not directly comparable to those in North America nor do the institutions they attended have comparable curricula. As a result, developing admissions criteria for international dental studies programs is a challenge.

The University of the Pacific Arthur A. Dugoni School of Dentistry has a successful International
Dental Studies (IDS) program for educating individuals who have earned a dental degree in another country. Since 1994 the school has had classes of ten to sixteen students enrolled in the twenty-four-month IDS program, which is closely integrated with the predoctoral dental program. The number of applicants to the IDS program has always substantially exceeded the number of available positions, so enhancing the predictive criteria for the admissions process is important for its success.

This study sought to determine whether there are significant correlations between admissions criteria used for the IDS program and students’ performance in the program. An additional benefit of this study would be to identify which of the initial tests or combination of tests have the most predictive value. These findings may provide insight into ways of enhancing the validity and effectiveness of the program’s admissions process.

Literature Review

In their study of foreign-trained dentists in the United States, Sweis and Guay reported that 4,136 candidates seeking licensure took the National Board Dental Examination (NBDE) Part II from 2002 through 2005. The countries of origin for the largest number of these candidates were India, the Philippines, and Colombia. Even in 1980, Browder et al. had noted that the “flow of foreign dental graduates into the United States has increased markedly.” Their study was aimed at identifying which of the variables (or combination of variables) collected during the admissions process were most effective as predictors for success in international dental studies programs. They acknowledged that “several factors unique to foreign dental schools, such as the lack of an accreditation process or a uniform grading system, have made this selection process difficult.”

Documenting some of these inconsistencies, Komabayashi et al. reviewed significant differences between the dental education systems in India, Japan, and the United States. In India, for example, the dental degree is granted after five years of study (four years of dental school followed by one mandatory internship year) comprised of an average 4,035 curriculum hours, whereas in Japan earning a dental degree takes six years and approximately 5,060 curriculum hours. There is no nationwide licensure in India, and there is no clinical examination at graduation in Japan. The diversity of dental education across various countries and the challenges of integrating dentists from those countries into a unified system are well illustrated by the situation in Europe. Scott described the two main dental education systems in effect in Europe as based on either the stomatology or the odontology approach. The two systems differ significantly: the stomatology approach, which considers dentistry to be a part of medicine, includes substantial education in general medicine, whereas the odontology approach regards dentistry as an independent discipline and provides considerably less medical coursework. Zelles et al. reported that the stomatology-based curriculum includes 50 percent more hours in general medicine and 27 percent fewer hours for dentistry than the odontology model.

Despite the differences between international programs and those for domestic predoctoral dental students, some of the research done on the predictive power of predoctoral admissions criteria is relevant to our study. Based on their analysis of the results of the written examination for all candidates for licensure in Canada from 1994 to 1996, Gerrow et al. found only “a small difference between the performance of graduates of Canadian and U.S. programs,” but that “Canadian and U.S. graduates performed significantly better than graduates of other international programs.” Consequently, the Canadian and U.S. graduates were required to pass the same examination for licensure in Canada, whereas all other graduates were directed through a different certification process. However, as Boorberg et al. reported, the National Dental Examining Board (NDEB) of Canada implemented new rules starting in 2000. With that change, all foreign-trained dental graduates of non-accredited dental programs from the United States or elsewhere must complete one of the specially designed two-year training programs prior to taking the NDEB examination and an objective structured clinical exam (OSCE).

The relative value of various predental performance indicators has been a subject of debate. Some authors have argued that students’ undergraduate GPA is a single, consistent indicator that can predict their performance in dental school. In other studies, researchers have found that two and sometimes more admission variables were able to better predict performance outcomes—the most reliable of which were undergraduate total GPA and Dental Admission Test (DAT) academic score. According to Sandow et al., the DAT academic score correlated “particularly strongly” with NBDE Part I (NBDE I) and Part II (NBDE II) scores. A strong correlation
was also found between undergraduate GPA and Perceptual Ability Test (PAT) score and the NBDE I and NBDE II scores. These findings are important for our study because we have access to our applicants’ NBDE I and NBDE II scores. Within reason, one could presume that those who have similar NBDE I or NBDE II scores possess a comparable academic/scientific foundation. However, as far as the PAT is concerned, several studies have characterized it as less consistent in its implications.12,15,16

There are also varying opinions on the predictive value of the admissions interview. Some researchers17,18 have argued that the interview is not a reliable predictor of success, while others have found a weak correlation and concluded that it might be one of several influencing factors.19,20 One group of researchers reported that the interview has a definite, strong, and positive correlation with academic success and explain this by the elaborate character of the interview used at the University of Florida College of Dentistry.14

Less research has been done regarding candidates for international dental studies programs than regarding predental applicants, perhaps due to the relatively small number of dental schools (thirty-two in the United States in 2009) that offer international programs and their small class sizes. In a report published in 2005, Stacey and Whittaker21 reported on their study of 171 students enrolled in the International Dental Program at Loma Linda University. These researchers found that the NBDE I and II, the Test of English as a Foreign Language (TOEFL), and a dexterity test similar to the old chalk carving test all predicted final academic performance in the program, but that the interview did not. Those students’ overall clinical performance was marginally related to the NBDE I and TOEFL and related to the NBDE II (r=0.215) and the dexterity test (r=0.209). In contrast with those conclusions, researchers analyzing the data for seventy-four students enrolled in the International Dental Studies program at Pacific22,23 found that TOEFL scores were the most significant predictor. That Pacific study22 agreed with the Loma Linda study in finding bench tests to be relevant predictors of clinical performance as well.

Educators’ initial impulse might be to use the same admissions criteria for applicants to international programs as for predental applicants. Unfortunately, duplicating the predental approach is not practical since there are significant differences between the data available for domestic undergraduates and for foreign-trained dentists. International applicants have no DAT scores or comparable GPAs, and even if they could provide descriptions of their dental school curricula and their grades, it would be difficult to compare them equitably given the wide range of training and grading philosophies around the world. In the absence of those typical predential admissions criteria, admissions committees for international programs typically use TOEFL scores, scores on dexterity tests, and admission interviews along with scores on the NBDE Parts I and II, a valuable indicator of the applicant’s specific knowledge and skills.

Methods

At Pacific, the admissions committee uses a varied set of criteria for selecting students for the IDS program, so this study hypothesized that standardized written examinations, lab tests of dexterity, and interviews were predictors for in-school performance and sought to determine the most complete predictive model based on the data set available. We used data for students enrolled in the IDS program from the classes of 1994 to 2004. Pacific started the program in 1987, and each year’s class size ranged from ten to sixteen students over this period. The 1994 to 2004 classes had a total of 148 students, four of whom failed to complete the program. The first six IDS classes were the subject of research published by Simon et al. in 1997;22 our study is the successor to that one. We had access to all the admissions data used for the IDS program for the designated years, and we also had in our database the students’ grades in the IDS program.

The academic outcome variables in this study were the students’ cumulative GPA for laboratory, didactic, and clinical courses of the first four quarters of the program (4Q GPA) and cumulative GPA for the entire eight quarters of the program (8Q GPA). The 8Q GPA scores include data from the 4Q GPA variable. The IDS students are enrolled in a twenty-four-month fast-paced program in which they receive training in academic subjects plus dentistry-specific lab and clinic work. Courses in the first year of the program are a balanced combination of didactic, laboratory, and clinical courses. Students’ progress is evaluated by grades based on each of these activities. Grades in the second year are almost entirely reflective of clinical performance. Pacific uses a competency approach for determining qualification to graduate, and IDS students must satisfy the same standards as predental students.
The variables of interest as potential predictors of the academic outcomes were students’ TOEFL scores, NBDE II scores, scores on dexterity tests, and interview scores. The TOEFL score assesses knowledge of English as a foreign language. Although the NBDE II is not required for application to the program, a significant number of applicants take it and submit their scores, and the admissions committee takes them into consideration for those students. As part of their application evaluation, the IDS candidates are given dexterity tests, which consist of dental procedures on ivorine teeth. This independent variable, Tech-FX, is coded on a numeric scale from 0 to 12 in which 12 is the best grade. A companion variable, Tech-OP, reflects performance on a Class II amalgam preparation in a laboratory simulation. Finally, there are two independent interviewers for each candidate. Standardized questionnaires are not used, but each interviewer gives the candidate a score on a scale from 0 to 3 in which 3 is the best. The variables for these interview scores are designated INT 1 and INT 2. Many faculty members participate in the interview process, so these designations are arbitrary: a given faculty member may be INT 1 on one occasion, INT 2 the next time, and then not participate at all for other candidates.

We first computed correlations between the variables. After that, we evaluated a number of multivariate linear regression models, seeking a model that would have as many statistically significant parameters as possible.

### Results

Descriptive statistics are presented in Table 1. All the mean values are toward the upper end of the range in each category, a normal result of the selection process that produces negatively skewed but still normal distributions.

The TOEFL, NBDE I, and NBDE II scores correlated significantly with the academic outcome variables, with the NBDE II scores correlating most strongly with the Q4 GPA ($r=0.399; p<0.001$) and the Q8 GPA ($r=0.470; p<0.001$). However, the NBDE II scores were not available for all applicants since only some of them took this exam before applying for admission. We did not have access to the results for any who took the exam after entering the program.

The results in Table 1 show that the two Tech exam scores and the two interview scores did not correlate significantly with the Q4 GPA. However, the Tech-OP scores and the Interviewer 2 scores did correlate significantly with the Q8 GPA ($r=0.145; p<0.05$; $r=0.183; p<0.05$).

Although these four variables that are of interest as potential predictors of the academic outcomes did not correlate significantly with the Q4 GPA and

### Table 1. Descriptive statistics for predictors of academic performance of students in the University of the Pacific International Dental Studies Program

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Average</th>
<th>SD</th>
<th>NBDE I</th>
<th>NBDE II</th>
<th>Tech-FX</th>
<th>Tech-OP</th>
<th>INT 1</th>
<th>INT 2</th>
<th>Q4 GPA</th>
<th>Q8 GPA</th>
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<tbody>
<tr>
<td>TOEFL</td>
<td>137</td>
<td>599.0</td>
<td>43.7</td>
<td>-.062</td>
<td>.215</td>
<td>-.189*</td>
<td>-.178*</td>
<td>.263**</td>
<td>.119</td>
<td>.236**</td>
<td>.348**</td>
</tr>
<tr>
<td>NBDE I</td>
<td>147</td>
<td>85.9</td>
<td>5.4</td>
<td>.570**</td>
<td>-.037</td>
<td>-.015</td>
<td>.096</td>
<td>.175*</td>
<td>.384**</td>
<td>.286**</td>
<td></td>
</tr>
<tr>
<td>NBDE II</td>
<td>60</td>
<td>79.8</td>
<td>5.0</td>
<td>-.157</td>
<td>.239*</td>
<td>.203</td>
<td>-.073</td>
<td>.399**</td>
<td>.470**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech-FX</td>
<td>148</td>
<td>8.5</td>
<td>1.8</td>
<td>.398**</td>
<td>.026</td>
<td>.024</td>
<td>-.027</td>
<td>-.016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tech-OP</td>
<td>148</td>
<td>8.6</td>
<td>1.7</td>
<td>.187*</td>
<td>.142</td>
<td>.097</td>
<td>145*</td>
<td>.057</td>
<td>.034</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT 1</td>
<td>91</td>
<td>2.5</td>
<td>0.8</td>
<td></td>
<td>.263*</td>
<td>.057</td>
<td>.183*</td>
<td>.026</td>
<td>.183*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INT 2</td>
<td>91</td>
<td>2.7</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q4 GPA</td>
<td>144</td>
<td>3.1</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.800**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q8 GPA</td>
<td>144</td>
<td>3.0</td>
<td>0.4</td>
<td></td>
<td></td>
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*Correlation is significant at the 0.05 level (1-tailed).
**Correlation is significant at the 0.01 level (1-tailed).
two did not correlate significantly with the Q8 GPA, we still included them in the multiple regression analyses together with the TOEFL, NBDE I, and NBDE II scores as potential predictors for the Q4 GPA and the Q8 GPA. When all seven variables were entered into the two analyses, no significant prediction could be made.

Because of the significant correlations among the TOEFL, NBDE I and NBDE II scores, and the Q4 GPA and Q8 GPA, these three variables were included in regression analyses as potential predictors for Q4 GPA and Q8 GPA. The results for the restricted model for predicting the Q4 GPA showed that this model was significant \((p<0.001)\) and accounted for 20 percent of the variance \((R^2)\) of Q4 GPA. The results of the restricted model for predicting the end of the program GPA was also significant \((p<0.001)\) and accounts for 20 percent of the performance on this academic outcome measure.

Discussion

This study was designed to contribute to a better understanding of admissions data as predictors of overall performance of international dental students in their academic program. The admission committees must use what is available to them because the design and application of a particular test are expensive and might even be unfair for the entire group of applicants.

Our study found that the conclusions drawn by Simon et al. in 1997\(^2\) are still valid today. Itaya et al. in 2008\(^2\) found that TOEFL and NBDE I scores are the most positive predictors for GPA. Our study agrees in finding that TOEFL and NBDE I scores were the strongest predictors for student performance, whereas laboratory exams and interviews had little predictive value. The regression results reported by Stacey and Whittaker in 2005\(^3\) are not directly comparable to our study because the Loma Linda study included the NBDE II as a predictive variable despite the fact that half of their students took the test near the end of their U.S. dental training. The NBDE II is not properly a “predictor” as a result, and because of its correlation with actual predictors such as the NBDE I and TOEFL, they are blocked from entry in a step-wise regression model.

We believe our findings about the TOEFL make sense because mastering the language of instruction is intuitively a basic advantage. It might even suggest a community of studying styles and personality trends that make the educational process easier for those who can communicate better and at a more nuanced level. Our findings regarding the NBDE I also came as no surprise. Besides being a comprehensive indicator of specific skills in dentistry, this measure has been identified by other researchers as strongly correlated to our domestic students’ specific knowledge of subjects required for good dental school performance. It may be possible to say that international applicants with a high NBDE I score have the same level of dentistry-related knowledge and abilities as our domestic students with a similar NBDE I score.

Another finding of our study is that some of the admissions criteria are not statistically relevant for subsequent evaluation of the students. This might suggest that those parameters should be reanalyzed and reshaped, so that they may, in revised form, become valuable indicators. Indeed, the technical exams and the interview process are currently undergoing review for that purpose. Additional research would be necessary to determine the extent to which our findings about the admissions predictors for our program are relevant for other international programs.

Conclusion

This study has shown, through a multiple regression analysis, that the TOEFL and NBDE I exams have strong and reliable predictive value for evaluating applicants for Pacific’s international students program. These criteria were found to have solid statistical significance and reasonably good correlation with the target parameters: the students’ GPA at the end of both program years.

REFERENCES