

Appraisal of the Dental School Learning Environment: The Students' View

**David Henzi, Ed.D.; Elaine Davis, Ph.D.; Roma Jasinevicius, D.D.S.;
William Hendricson, M.S., M.A.; Laura Cintron, M.A.; Marcia Isaacs, B.A.**

Abstract: The majority of studies examining dental school curriculum have addressed organization, structure, and content issues from the perspectives of administrators, faculty, practitioners/alumni, and professional organizations. However, few studies have focused on students' opinions of dental school. The purpose of this study was to determine students' perceptions of the learning environment, intellectual climate, and teacher-student relationships in dental school. This report describes how the "dental version" of the Medical Student Learning Environment Survey (MSLES) was used to identify students' perceptions of their dental education. Freshman and junior dental students' perceptions were measured with the Dental Student Learning Environment Survey (DSLES), which evaluates learning environment, intellectual climate, and relationships among students and teachers in seven areas: flexibility, student-to-student interaction, emotional climate, supportiveness, meaningful experience, organization, and breadth of interest. The DSLES was mailed to twenty-three dental schools in North America with eighteen of the schools distributing the inventory. A total of 619 dental students responded. Results were differentiated between freshman and junior dental students. Both freshman and junior students provided the highest (most positive) ratings for the DSLES subscales of "breadth of interest" (interest in dentistry and outside interests are encouraged) and "meaningful learning experience" (significance of courses to dentistry). Freshman students provided the lowest (least positive) ratings for "emotional climate" (students' responses to the way their courses were conducted and stress levels), and junior students provided the least positive ratings for "faculty supportiveness" (extent of faculty support and encouragement provided to students). The DSLES identified students' perceptions of their educational experience and localized areas for improvement. By addressing these areas of concern, faculty can increase student satisfaction with their dental education.

Dr. Henzi is Educational Development Specialist, Division of Educational Research and Development, Department of Academic Informatics Services, University of Texas Health Science Center at San Antonio; Dr. Davis is Associate Dean, Student Affairs, State University of New York at Buffalo, School of Dental Medicine; Dr. Jasinevicius is Assistant Professor, Comprehensive Care Department, Case Western Reserve University, School of Dental Medicine; Mr. Hendricson is Director, Division of Educational Research and Development, Department of Academic Informatics Services, University of Texas Health Science Center at San Antonio; Ms. Cintron is Social Science Research Associate, Division of Educational Research and Development, Department of Academic Informatics Services, University of Texas Health Science Center at San Antonio; and Ms. Isaacs is Social Science Research Associate, Division of Educational Research and Development, Department of Academic Informatics Services, University of Texas Health Science Center at San Antonio. Direct correspondence and requests for reprints to Dr. David L. Henzi, Educational Development Specialist, Division of Educational Research and Development, Department of Academic Informatics Services, University of Texas at San Antonio, 7703 Floyd Curl Drive, San Antonio, TX 78229-3900; 210-567-2290 phone; 210-567-2281 fax; henzi@uthscsa.edu.

This study was supported by a grant from the Council of Sections Project Pool of the American Dental Education Association.

Key words: dental education, dental students, curriculum, stress

Submitted for publication 5/5/05; accepted 7/7/05

There has been extensive dialogue within the dental community about the future directions of dental education for the past ten years since the publication of the Institute of Medicine (IOM) report.¹ Most of this dialogue has emanated from faculty, practitioners, alumni, and professional organizations, but there has been one group often overlooked during this discussion: dental students. This lack of input from the "consumer" of dental education is striking in that there is a long-standing per-

ception within the dental education community that students do not like their experiences in dental school, perhaps because of an overly stressful learning environment.² Identifying areas of concern from the dental students' perspective can provide dental educators with a road map that will help those responsible for curriculum revision. The purpose of this study was to determine dental students' perceptions of the learning environment, intellectual climate, and teacher-student relationships in dental school at two

critical transitional periods in their education: the freshman year when they experience the bulk of the basic science curriculum and are making the transition from the undergraduate environment to professional school, and during the junior year when they make the transition from the classroom to clinical environments and commence patient care. Freshman and junior dental students' perceptions were measured with the Dental Student Learning Environment Survey (DSLES). Perceptions of sophomore and senior students about various other aspects of their dental education were assessed with other instruments as described later in this article; these results will be reported in separate manuscripts.

Background

The Missing Component: What Do Dental Students Think About Their Dental Education?

Dental student perspectives on the content, structure, and quality of their educational experience are an essential component of a broad-based assessment of the curriculum and an important source of data for policy decisions that will ultimately evolve from the current curricular introspection. Yet, there has been virtually no effort to formally determine the "student viewpoint." There appears to be a widely held belief among dental educators that dental students are dissatisfied with their educational experience. Bertolami, for example, states that "one of the biggest tip-offs that the form of dental education needs revision is the simple observation that dental students do not, in general, like dental school."³ However, there is no empirical documentation of this phenomenon, and there have been anecdotal reports of dental students at some schools who rate their educational experience positively.

The American Dental Education Association obtains opinions about curricular content/emphasis (e.g., too much, too little, about right) from graduating seniors annually and communicates this information to schools, but these reports provide no qualitative data (i.e., students' perceptions of their learning experiences) to guide curricular decision making. A Medline review encompassing 1978-2003 identified twenty-eight interview or survey-based studies for dental education that reported the perceptions and opinions of enrolled students or recent graduates

about the process and structure of predoctoral education, program strengths and weaknesses, and adequacy of preparation for practice and/or recommendations for program modifications. These studies went beyond the typical course questionnaires employed to solicit student feedback about individual components of a curriculum.

These twenty-eight studies addressed a variety of issues including student values,⁴ student and graduate perceptions of their academic preparation for professional roles,⁵⁻⁸ evolution of attitudes about career choice,²² graduates' perceptions of training in various oral health specialties,⁹⁻¹² self-perceived competence at graduation,¹³⁻¹⁴ graduates' use of techniques taught in dental school,¹⁵ student assessment of curriculum changes or school closing,¹⁶⁻¹⁹ impact of the learning environment on student values,²⁰ impact of learning environment on student perception of stress,^{2,21-24} graduates' perception of their profession and themselves as care providers,²⁵⁻²⁶ perceptions of students about providing dental care to others outside the main dental facility,²⁷ students' perspectives about HIV infections and AIDS,²⁸ and students' perspectives on various curriculum delivery formats including online instruction and other aspects of electronic curriculum.²⁹⁻³⁰

However, only two of the twenty-eight studies involved a nationwide sample of students and requested a comprehensive assessment of their dental school experience. One of these involved an unpublished study of student opinions about their dental education in Sweden and Finland (reported in Farge et al.¹⁷); the other, by Gerbert et al., reported data from U.S. dental students collected between 1980 and 1982.³¹ The Gerbert study was the catalyst for the current "senior survey" conducted by ADEA about the appropriateness of content emphasis in the dental school curriculum. Gerbert et al. surveyed 362 dental school graduates regarding the adequacy of their dental education for opening a practice and practicing dentistry. Seventy-five curriculum topics were listed, and the graduates ranked their level of preparedness on a five-point scale. Ten areas in which the graduating students felt well prepared centered in preventative dentistry, restorative dentistry, and radiology. Ten of the areas in which the students felt least prepared were from behavioral sciences, practice management, and orthodontics. Although this study yielded valuable information about students' perception of topic coverage, no data on the students' impressions of favorable and unfavorable aspects of the dental school environment were obtained.

In summary, our review of the literature found no reports of a broad-based, multischool assessment of U.S. dental students' qualitative impressions of their educational experience and the learning environment in dental school. There has been extensive commentary about the future structure, scope, and goals of dental education by faculty, practitioners, and blue ribbon study commissions for an entire decade since the IOM report.³²⁻³⁵ But there has been no effort to determine the opinions and recommendations from the other side of the table—from the students who consume the educational “meal” served to them. As the old saying goes, “If you are serious about evaluating the quality of a meal, you don’t ask the chef; you ask the people who paid for it and who ate it.”

It is imperative for curriculum committees and administrators to not only evaluate selected portions of a dental school but also to address the entire efficiency of the program. Course evaluations are used to identify strengths and weaknesses of courses but may fail to address other important issues related to dental school education because they do not ask the student to reflect on the overall curricular experience and entire learning environment with the school. Thus, negative perceptions that could have unforeseen consequences on student performance during school and their overall satisfaction with the profession may go undetected in spite of an elaborate system to individually evaluate each course in the curriculum. For example, Hendricson et al.³⁶ identified that U.S. and Canadian dental schools have devoted major effort to enhancing information technology capacity and incorporating electronic curriculum into the students' educational experiences (for example, online courses, required purchase of laptops with embedded software, wireless classrooms, convenient access to email and the Internet, electronic patient record systems). However, nearly 1,000 dental students who participated in a fifteen-school study by Hendricson et al. in 2004 were largely skeptical about the value of e-curriculum from educational and financial perspectives.³⁷

Learning Environment Assessment Instruments

Beginning in the 1970s, a number of survey-based instruments were developed to assess students' perceptions of their learning experiences and the overall environment within a school. Educators were stimulated to examine the influence of school envi-

ronment on student performance by a series of reports that indicated that students' perceptions of their school's educational, emotional, and social environment were stronger predictors of academic performance in universities than prior achievement in secondary school.³⁸ Learning environment research became a major line of inquiry in secondary and higher education, and a journal specifically devoted to this area of inquiry—*Learning Environment Research*—emerged in the 1990s. A variety of instruments were developed for college and university education including the Classroom Environment Scale, The Learning Environment Inventory, and the College and University Environment Inventory.³⁹

Health professions educators also developed interest in exploring students' opinions about their learning experiences. The catalyst for a number of instruments developed to explore the unique environment of health professions was the Medical School Learning Environment Survey (MSLES) originally created in the 1970s by Marshall. The first published use of the MSLES was a 1978 analysis of medical students' perceptions of the education they received in the Chicago Medical School.⁴⁰ Marshall developed the MSLES to identify perceptions of the learning environment, intellectual climate, social environment, and student-teacher relationships and determine how these components affected student stress and academic performance. The MSLES quickly caught on among medical schools and became an “instrument of choice” during the 1980s and 1990s to help faculty understand how students felt about the learning climate in school.⁴¹ Medical school administrators believed if they could identify areas in the educational process leading to medical students' dissatisfaction, corrective action could be implemented in the curriculum. The MSLES spawned a number of similar environmental assessment instruments that closely followed the MSLES format and used many of the same items including the Clinical Post Conference Environment Survey (CPCLES)⁴² and the Clinical Learning Environment Inventory (CLEI)⁴³ in nursing education, the Dundee Ready Education Environment Measure (DREEM) in medical education,⁴⁴⁻⁴⁵ and several others.⁴⁶

The original MSLES contained fifty items although subsequent versions contained fifty-five items subdivided into seven scales. The MSLES was developed to measure student perceptions of 1) the extent of opportunities for faculty and students to modify the learning environment and the degree of control imposed on students (Flexibility); 2) the ex-

tent to which students in different years and the same year mix socially and academically (Student-to-Student Interactions); 3) the way in which students' experiences in their courses affects their nonintellectual (affective) perceptions of the school's environment (Emotional Climate); 4) the extent of staff support and encouragement provided to students (Supportiveness/Nurturance); 5) the degree to which structured learning activities are seen to be relevant to the practice of medicine (Meaningful Experience); 6) the degree of overall cohesion and coherence of learning experiences within the curriculum (Organization); and 7) the extent to which students are encouraged to develop and sustain extracurricular activities outside of regular coursework (Breadth of Interest). Four of the MSLES scales (Breadth of Interest, Student Interaction, Organization, and Flexibility) came from a previous school environment survey developed by Rothman and Ayoade,⁴⁷ while the other three scales (Meaningful Learning Experience, Emotional Climate, and Supportiveness/Nurturance) were based on Marshall's work with medical students to determine sources of stress and academic dysfunction. Table 1 includes the seven MSLES scales, definitions of each scale, and examples of items in each category.

For each MSLES item, students respond using a four-point scale: 1=seldom, 2=occasionally, 3=more often than not, and 4=very often. Some items are stated in the positive form (e.g., faculty try out new teaching methods and materials), and others are

stated in the negative form (e.g., the educational experience makes students feel depressed). Each item is scored 1=seldom to 4=very often, with score reversals where necessary so that all positive attributes receive high scores.

Feleti and Clarke demonstrated the reliability of the instrument by calculating the internal consistency (Cronbach's alpha) of the MSLES subscales at two Australian medical schools using samples of 165 and 112 students. At one school with a traditional, lecture-based curriculum, internal consistency ranged from lows of 0.56 for the Flexibility and Breadth of Interest scales to 0.76 for Supportiveness with an overall alpha of 0.89. At a school with a problem-based learning curriculum, internal consistency ranged from 0.70 for Flexibility and Social Interaction to 0.82 for Supportiveness with an overall alpha of 0.94.⁴⁸ Marshall reported an overall reliability of 0.92.⁴⁰ Feleti and Clarke subsequently demonstrated that the MSLES had a strong overall test-retest reliability of 0.75.⁴⁹ MSLES results are reported in the form of means and standard deviations of each of the seven subscales. On previous administrations of this learning environment assessment inventory, means for each subscale typically ranged from 1.50 to 3.00. Higher scores indicate a more positive and supportive learning environment, and lower scores indicate an environment that is potentially less desirable. For example, in Marshall's original usage of the MSLES with medical students, the subscale Meaningful Learning Experience received the low-

Table 1. DSLES scales, scale description, and examples of scale items

Scale and Number of Items	Description and Example Items
Flexibility (6)	Extent of opportunities for students to modify the learning environment. Example: Students are able to shape their academic program to fit their individual needs and preferences.
Student-to-Student Interactions (6)	Degree to which students mix socially and academically. Example: Students in school get to know each other well.
Emotional Climate (8)	The way in which students' experience affects their perceptions of dental education. Example: Students' anxiety hinders them from achieving up to their full potential.
Supportiveness (9)	Degree of concern expressed and support provided by faculty for students. Example: The school takes an interest in the personal welfare of the students.
Meaningful Experience (10)	Extent to which structured learning activities are perceived to be relevant to the practice of dentistry. Example: The educational experience makes students feel a sense of achievement.
Organization (9)	Degree of coherence of educational experiences within the curriculum. Example: Classes progress systematically from week to week.
Breadth of Interest (7)	Extent to which students are encouraged to develop a variety of activities within and outside regular coursework. Example: Faculty try to get students interested in the broad social context of oral health care.

est mean score (1.9) while Supportiveness/Nurturance was rated the highest by students (2.8).⁴⁰

In order to gain a better appreciation of dental students' perceptions of their education, the MSLES was slightly modified by one of the coauthors in the early 1990s to create a parallel instrument for dental school known as the DSLES (Dental Student Learning Environment Survey). The DSLES is identical to the MSLES except for one item where "dentistry" replaces "medicine" and two items where "dentist" replaces "physician." For example, the MSLES statement "Students feel that they are learning what they need to learn in order to become competent physicians" is "Students feel that they are learning what they need to learn in order to become competent dentists" in the DSLES. The DSLES consists of the same subscales as the MSLES as previously described: Flexibility, Student-to-Student Interaction, Emotional Climate, Supportiveness, Meaningful Experience, Organization, and Breadth of Interest. The four-point rating scale was identical to the MSLES except for changing "more often than not" to "fairly often" based on feedback from previous student users of the DSLES who recommended that the phrase "fairly often" was easier to understand and constituted a more representative response. The DSLES was used to monitor impact of curriculum changes at two dental schools in 1990 and 1993, and the reliability of the DSLES was also assessed based on responses from a total of 163 dental students (Personal communication from William Hendricson). Internal consistency of the DSLES scales ranged from .67 to .86 with an overall alpha of .91, which is similar to other reports.

The DSLES is one of three components of a larger project entitled the Students' Perspective Project (SPP), a study funded by the Council of Sections Project Pool of the American Dental Education Association. The overall goal of the SPP was to identify areas of strengths and weaknesses within dental education from the students' perspective and provide administrators with target areas for improvement. The two other forms used in the SPP were the Clinical Education Instructional Quality Questionnaire (ClinEdIQ) and the Curriculum Strengths, Weaknesses, Opportunities, and Threats (C-SWOT) survey. The ClinEdIQ is a validated instrument that has been used in several health professions to measure learners' perceptions of instructional quality in four components of clinical experience: teacher activities, learner involvement, learning opportunities, and environment for learning. Junior and senior den-

tal students and graduate students completed the ClinEdIQ at each participating SPP school. The Curriculum SWOT questionnaire, which employs an open-ended, write-in format, was completed by sophomore and junior students and graduate students at each SPP school to obtain student perceptions of the overall quality of predoctoral dental education including curriculum strengths, curriculum weaknesses, opportunities for improvement, and threats to program viability and attractiveness to applicants. Results from the ClinEdIQ and the C-SWOT surveys will be published subsequently.

Methods

To gain an appropriate cross section of dental students, freshman and junior students were identified as subsets who could provide potentially unique perspectives on the dental school environment due to their different locations in the journey through the curriculum and also because both groups were experiencing a major transitional phase as previously described. An invitation letter was sent to the associate dean for student affairs in each North American dental school in the spring of 2002. This letter discussed the background and goals of the project as well as requirements for participation and time tables for completion. Of the sixty-five dental schools in North America in 2002, twenty-three (35 percent) originally agreed to participate in the study. Project materials were then sent to the associate dean for student affairs of these schools for distribution. The materials included copies of the DSLES inventory, background information on the DSLES inventory, a DSLES Frequently Asked Questions (FAQ) list, University of Texas Health Science Center at San Antonio Institutional Review Board (IRB) information sheet, and directions for the distribution and completion of the DSLES. Eighteen of the twenty-three schools complied with the protocol and returned DSLES from their students (28 percent of total dental schools in North America). The names of the participating dental schools and the total number of students who participated at each school are provided in Table 2. The "Not Applicable" notation in the junior year column for the University of Nevada, Las Vegas indicates that UNLV did not have third-year students at the time of the study due to the recent establishment of the dental school.

Students were recruited at the discretion of the associate dean for student affairs at each dental school

Table 2. Participating dental schools and number of students who completed the DSLES

School	Freshmen	Juniors
Columbia University	15	15
Creighton University	30	16
Marquette University	15	15
Oklahoma University	10	15
State University of New York at Buffalo	9	7
State University of New York, Stony Brook	30	36
Tufts University	15	18
University of British Columbia	22	10
University of Connecticut	15	15
University of Georgia	15	15
University of Missouri	11	14
University of Nevada, Las Vegas	25	N/A
University of Oregon	15	13
University of Pittsburgh	77	17
University of Saskatchewan	14	16
University of Southern California	14	14
University of Texas Health Science Center at San Antonio	15	13
University of Toronto	13	10
Totals	360	259

by email, phone, and personal solicitation. Students were then provided a copy of the DSLES, instructions for completion, and the University of Texas Health Science Center at San Antonio IRB form. Following completion of the DSLES, students were asked to turn the form in to the school's administrative assistant. Freshman and junior students were assigned different timelines to complete the surveys so as to minimize difficulties associated with identifying participants. Freshman students were asked to complete the survey between the months of January

and March 2003 while junior students were asked to complete the survey between November 2002 and March 2003. More time was allotted to junior students to accommodate time constraints associated with the clinical component of the curriculum.

When the study was originally designed, the project called for twenty-five freshman and twenty-five junior students from the participating schools to complete the survey. Due to the larger than expected number of schools that agreed to participate in the study, the original numbers requested were decreased to fifteen students per year (thirty respondents per school). However, several schools submitted more than the requested fifteen each from freshman and junior students. This brought the average number of respondents to twenty-seven, which was close to the thirty students per school that was the original sample size target. Overall, a total of 619 dental students completed the DSLES (360 freshmen and 259 juniors) during the spring semester of 2003.

Results

The results are summarized in Table 3. Of the seven DSLES scales, the most positive (highest) mean scores for both freshman and junior students were Breadth of Interest (freshmen=2.68 mean, 0.96 SD; juniors=2.60 mean, 0.97 SD) and Meaningful Learning Experience (freshmen=2.66 mean, 0.93 SD; juniors 2.62 mean, 0.90 SD). Freshman students provided the least positive (lowest) scores for Emotional Climate (2.22 mean, 1.01 SD). Faculty Supportiveness was the lowest scale for junior students (2.36 mean, 0.97 SD). Table 4 indicates the rank order of DSLES subscales for both classes from highest scores to lowest. The overall mean score across all seven DSLES scales was 2.49 for both freshman and junior students. The only DSLES scale with a substan-

Table 3. Summary of DSLES results at eighteen North American dental schools, 2003

	FRESHMEN		JUNIORS	
	Mean	SD	Mean	SD
Flexibility	2.40	1.00	2.39	1.05
Student-to-Student Interaction	2.43	1.10	2.47	1.08
Emotional Climate	2.22	1.01	2.46	1.03
Faculty Supportiveness	2.48	1.07	2.36	.97
Meaningful Experience	2.66	.93	2.62	.90
Organization	2.56	1.06	2.56	1.00
Breadth of Interest	2.68	.96	2.60	.97
Totals	2.49	1.02	2.49	1.00

Table 4. Rank order of DSLES subscales (highest scores to lowest)

Order of Subscales			
Freshmen	Mean/SD	Juniors	Mean/SD
Breadth of Interest	(2.68/.96)	Meaningful Experience	(2.62/.90)
Meaningful Experience	(2.66/.93)	Breadth of Interest	(2.60/.97)
Organization	(2.56/1.06)	Organization	(2.56/1.00)
Supportiveness	(2.48/1.07)	Student-to-Student Interaction	(2.47/1.08)
Student-to-Student Interaction	(2.43/1.10)	Emotional Climate	(2.46/1.03)
Flexibility	(2.40/1.00)	Flexibility	(2.39/1.05)
Emotional Climate	(2.22/1.01)	Supportiveness	(2.36/.97)

tially different score between freshmen (2.22) and juniors (2.46) was Emotional Climate. The overall DSLES means differed very little among the eighteen participating schools, and there were no meaningful differences between the four private and fourteen public schools.

Individual school results for the DSLES were tabulated and sent to the study representatives at the participating dental schools. The report differenti-

ated between the freshman and junior scores. An overall mean score of each of the seven subscales for both freshman and junior students, reflecting all eighteen schools, was calculated. This allowed schools to see how their students' responses compared to the composite responses from all participating schools. The report form for schools participating in this study appears in Table 5.

Table 5. Example of DSLES report sent to each participating school**Dental School Learning Environment Survey (DSLES)****XXXXX University; Freshman Students N=XX**

DSLES Subscales	Mean Your School	Stand Dev Your School	Mean All SPP School (n=18)	Stand Dev All SPP School (n=18)
Flexibility			2.40	1.00
Student-to-Student Interaction			2.43	1.10
Emotional Climate			2.22	1.01
Supportiveness			2.48	1.07
Meaningful Experience			2.66	.93
Organization			2.56	1.06
Breadth of Interest			2.68	.96
TOTAL			2.49	1.02

XXXXX University; Junior Students N=XX

DSLES Subscales	Mean Your School	Stand Dev Your School	Mean All SPP School (n=18)	Stand Dev All SPP School (n=18)
Flexibility			2.39	1.05
Student-to-Student Interaction			2.47	1.08
Emotional Climate			2.46	1.03
Supportiveness			2.36	.97
Meaningful Experience			2.62	.90
Organization			2.56	.989
Breadth of Interest			2.60	.97
TOTAL			2.49	1.00

Note: "Total" is the mean of the seven subscale scores.

Discussion

This study showed that there are common areas of dental school education that are viewed as more favorable for both freshman and junior students (Breadth of Interest and Meaningful Experience). Differences became evident when the freshman and junior results addressed areas of deficiencies. Freshman students identified Emotional Climate (the way in which students' experiences in their courses affect their non-intellectual [affective] perceptions of the school's environment) as an area of deficiency, while the junior students provided the lowest ratings for Faculty Supportiveness (2.36) and Flexibility (2.39).

Breadth of Interest was identified as one of the two highest rated subscales for both groups of students. This subscale focuses on the faculty's ability to address areas of interest outside the field of dentistry. This could be interpreted to mean that both freshmen and juniors believed that the dental school faculty valued the world outside of the realm of dentistry and encouraged students to pursue nondental interests. The subscale titled Meaningful Learning Experience was another favorable area of the students' dental education. This subscale addresses the degree to which structured learning activities were seen as relevant to the practice of dentistry and individual items addressed the relationship between basic science and clinical experience. Both groups of students were apparently encouraged by the faculty's ability to combine experiences to make their overall learning purposeful.

As mentioned earlier, one area of concern for the freshman class centered on the Emotional Cli-

mate of the dental school experience. Marshall identified Emotional Climate as the students' affective (nonintellectual) responses to their experiences within courses. The emotional reaction to freshman courses might lead students to develop a perception that all future courses and instructors will hold similar characteristics of recently completed courses. It would benefit dental education to identify what areas of the freshman curriculum are most problematic for students. By addressing these issues, freshman students might not develop potentially negative attitudes that carry over into subsequent components of their dental education.

Junior students were most concerned with Faculty Supportiveness. This subscale was originally titled "Nurturance" when first used by Marshall. The term "Faculty Supportiveness" references the student's perception of the faculty's and administration's level of concern for the student's welfare. The results indicate junior students are not entirely satisfied with the amount of support or nurturance received from faculty. Assessment of the data from the previously described ClinEdIQ instrument, which specifically focuses on teaching and learning issues in the clinic, may shed additional light on student perceptions of faculty support and nurturance in the clinical years.

Overall, the mean scores from this administration of the DSLES at eighteen North American dental schools were somewhat different from means reported by other investigators. Table 6 compares the mean scores obtained in this study of 619 freshman and junior dental students to five other reported administrations of the original MSLES involving a total of approximately 2,000 medical students^{40,48,49} and

Table 6. Comparison of DSLES/MSLES scores from several administrations

Scale	DSLES 2003 Freshman Dental Students	DSLES 2003 Junior Dental Students	DSLES 1990 All Dental Classes	DSLES 1993 All Dental Classes	Marshall 1976 U.S. Medical School	Feleti 1979 Standard Medical School	Feleti 1979 PBL Medical School	Feleti 1979 Australia Medical School	Feleti 1979 Australia Medical School
Flexibility	2.40	2.39	2.27	2.05	2.50	1.69	2.92	1.77	1.80
Student Interaction	2.43	2.47	2.74	2.60	2.60	2.50	3.00	2.55	2.65
Emotional Climate	2.22	2.46	2.58	2.66	2.30	2.43	2.92	2.49	2.75
Faculty Support	2.48	2.36	2.38	2.27	2.80	2.70	3.24	2.68	2.69
Meaningful Experience	2.66	2.62	2.20	2.35	1.90	2.23	3.36	2.26	2.25
Organization	2.56	2.56	2.48	2.62	2.50	2.52	2.67	2.48	2.54
Breadth of Interest	2.68	2.60	2.12	2.08	2.00	1.65	2.76	1.79	1.95
Total	2.49	2.49	2.39	2.37	2.37	2.28	3.00	2.32	2.40

two previous DSLES administrations involving 163 dental students. For example, the overall mean for both freshman and junior students in this study (2.49) was higher than four of the five comparison administrations in medical schools and higher than two previous dental school administrations. The means obtained for the scales of Meaningful Learning Experience and Breadth of Interest in this eighteen-school sample were higher than in four of the five medical school administrations and both of the previous dental school assessments in the early 1990s. In contrast, the means for Student-to-Student Interaction (both freshmen and juniors) and Emotional Climate, for freshmen, from this study were lower than previous reports.

Implication

Students' perception of their education is a subject that has received little attention by those providing dental school education. The results from this study contribute to the literature that identifies areas of strengths and weaknesses of students' attitudes toward their dental education. Both freshmen and juniors identified similar areas in which their dental education is viewed as favorable (Breadth of Interest and Meaningful Learning Experience), while different areas were identified as weaknesses. It is incumbent for curriculum committees to at the very least develop a dialogue with students in which areas addressing issues of concern are examined. The invitation for students to join in this communication will demonstrate the administrations' sincere interest in developing strategies that will help to increase students' positive impressions of their dental school experience.

Limitations

An original letter of interest to participate in this study was sent to all sixty-five dental schools in North America. Twenty-three of the schools agreed to participate in the study, but only eighteen returned materials. The foremost limitation in this study is the overall return rate of 28 percent. Caution must be taken when attempting to generalize the findings of the study to all dental schools across North America. Personal phone calls to the academic dean at the remaining five schools that agreed to participate in the study might have increased the overall return rate to 35 percent. Although these numbers still cannot be used to suggest generalizability, it

would have provided more information sources for dental students' perceptions of their education.

Another limitation was surveying only freshman and junior students for this project. By requesting information from these students, we hoped to obtain a suitable cross section of experiences in both the didactic and clinical components of the curriculum. Increasing the number of students who received the DSLES for completion might have increased the scope of student perceptions. In order to minimize the extra effort involved with survey distribution, limited numbers of students were asked to complete the survey. Other instruments involved in the Student Perspective Project (SPP) will hopefully identify strengths and weaknesses of the classes not surveyed in this study.

Conclusion

With its limits, this study represents an attempt to understand student perceptions of their dental school education. Overall, the DSLES scores obtained from 619 students at eighteen North American dental schools do not suggest that students in 2003 perceived the learning environment to be overly negative as some commentators have proposed, although freshman students' scores for the Emotional Climate and Student-to-Student Interaction scales were lower than reported in any other study using this instrument. The results from this study identified areas of strengths and weaknesses within dental schools across North America from a student's perception. Students are the group affected the most by their education, but oftentimes they feel they have the least amount of input for change. From the requirements for admission to dental school, to the required curriculum, to board certification, dental students are involved in a structure that does not leave much room for modification. Understanding some of the concerns of dental students might help faculty and administrators modify or change existing programs to meet some of the areas that have been identified as deficient when data from the DSLES was analyzed.

Acknowledgment

Special thanks to John Schoolfield, Department of Academic Informatics Services at the University of Texas Health Science Center San Antonio, for statistical analysis of the quantitative data reported in this article.

REFERENCES

1. Field MJ, ed. *Dental education at the crossroads: challenges and change*. Institute of Medicine. Washington, DC: National Academy Press, 1995.
2. Davis EL, Tedesco LA, Meier ST. Dental student stress, burnout, and memory. *J Dent Educ* 1989;59(3):587-97.
3. Bertolami C. Rationalizing the dental curriculum in light of current disease prevalence and patient demand for treatment: form vs. content. *J Dent Educ* 2001;65(8):725-35.
4. Casada JP, Willis DO, Butters JM. An investigation of dental student values. *J Am Coll Dent* 1998;65(3):36-41.
5. Kent GG, Croucher R. Priorities of undergraduate dental education: what do students think. *Med Educ* 1992;26:372-7.
6. Levy G, d'Ivernois JF, Brun D, et al. A French dental school programme appraisal of 5-9 years standing. *Eur J Dent Educ* 1997;1:70-7.
7. Berk NW, Close JM, Weyant RJ. Do student perceptions of their dental curriculum change over time? *J Dent Educ* 1998;62(11):934-7.
8. McCuniff MD, Holmes LG. Evaluation of attitudes—dental class of 1991: a nine year longitudinal study. *J Am Coll Dent* 1999;66(3):20-8.
9. Marciani RD, Smith TA, Kohn MW. Senior residents' opinions about oral surgery programs. *J Oral Surg* 1978;36(7):508-12.
10. Jacobsen PH, Curson I. Graduates' opinions of their training in conservative dentistry. *J Dent* 1980;8(1):75-80.
11. Pender N. Recent graduate opinion on orthodontic training. *Br J Orthod* 1982;9(2):73-6.
12. Amos LW, Purkey WW. Teacher practices and student satisfaction in dental hygiene programs. *Dent Hyg* 1988;62(6):286-91.
13. Hanley MR, Hendricson WD. Perceptions of senior student readiness for practice. *J Dent Res* 1985;64(3):186.
14. Holmes DC, Diaz-Arnold AM, Williams VD. Alumni self-perception of competence at the time of dental school graduation. *J Dent Educ* 1997;61(6):465-72.
15. Clark DM, Oyen OJ, Feil P. Dental education: the use of specific dental school taught restorative techniques by practicing clinicians. *J Dent Educ* 2001;65(8):760-5.
16. Kindelain J, Roberts-Harry D, Luther F. A study to determine if changes to an undergraduate orthodontic course improved course quality and student satisfaction. *Eur J Dent Educ* 1997;1(3):138-42.
17. Farge P, Virieux J, Doury J. Student satisfaction with curriculum modifications in a French dental school. *Eur J Dent Educ* 2000;4(3):112-7.
18. Parco T, Codel A, Arya A. Northwestern's last class. *CDS Review* 2000;93(6):20-2.
19. Ryding HA, Murphy JH. Assessing outcomes of curricular change: a view from program graduates. *J Dent Educ* 2001;65(5):422-6.
20. Vinton JC. A four-year longitudinal study of the impact of learning structure on dental student lifestyle values. *J Dent Educ* 1978;42(5):251-6.
21. Dodge WW, Dale RA, Hendricson WD. The effect of eliminating requirements on clinical performance: a preliminary study. *J Dent Educ* 1993;57(9):667-72.
22. Peretz B, Rosenblum A, Zadik D. Stress levels and related variables among dental students in Jerusalem, Israel. *Eur J Dent Educ* 1997;1(4):162-6.
23. Barberia E, Fernandez-Frias C, Suarez-Clua C, Saavendra D. Analysis of anxiety variables in dental students. *Int Dent J* 2004;54(6):445-9.
24. Pau AK, Croucher R. Emotional intelligence and perceived stress in dental undergraduates. *J Dent Educ* 2003;67(9):1023-8.
25. Gunn SM, Woolfolk M, Maxson B. Dentists: satisfaction and attitudes on the future. *J Am Coll Dent* 1990;57(1):12-5.
26. Cavanaugh S, Simmons P. Evaluation of a school climate instrument for assessing affective objectives in health professional education. *Eval Health Professions* 1997;20(4):455-78.
27. Ayers CS, Abrams RA, McCuniff MD, Goldstien BR. A comparison of private and public dental students' perceptions on extramural programming. *J Dent Educ* 2003;67(4):412-7.
28. Seacat JP, Inglehart MR. Education about treating patients with HIV infections/AIDS: the student perspective. *J Dent Educ* 2003;67(6):630-40.
29. Pilcher ES. Students' evaluation of online course materials in fixed prosthodontics: a case study. *Eur J Dent Educ* 2001;5(2):53-9.
30. Navsa N, Boon JM, L'Abbe LH, Greyling LM, Meiring JH. Evaluation of clinical relevance of a problem-orientated head and neck model. *SADJ* 2004;59(3):113-7.
31. Gerbert B, Badner V, Maguire B, Martinoff J, et al. Recent graduates' evaluation of their dental school education. *J Dent Educ* 1987;51(12):697-700.
32. Baum BJ. The dental curriculum: what should it be in the 21st century? *J Public Health Dent* 1996;56:286-90.
33. Graber DR, O'Neill EH, Bellack JP, et al. Academic deans' perceptions of current and ideal curriculum emphases. *J Dent Educ* 1998;62(11):911-8.
34. Canadian Dental Association. *The report of the task force on dental education*. Ottawa: Canadian Dental Association, 1998.
35. Haden K, Tedesco L, eds. *Leadership for the future: the dental school in the university*. Washington, DC: Center for Educational Policy and Research, American Association of Dental Schools, 1999.
36. Hendricson WD, Panagakos F, Eisenberg E, McDonald J, Guest G, Jones P, et al. Electronic curriculum implementation at North American dental schools. *J Dent Educ* 2004;67(10):1041-57.
37. Hendricson WD, Panagakos F, Eisenberg E, Johnson L, et al. Dental students' perceptions of electronic curriculum. Unpublished manuscript.
38. Lizzio A, Wilson K, Simons R. University students' perceptions of the learning environment and academic outcomes: implications for theory and practice. *Stud Higher Educ* 2002;27(1):27-52.
39. Fraser BJ. Classroom environment instruments: development, validity and applications. *Learn Environ Res* 1998;1(1):7-34.
40. Marshall RE. Measuring the medical school learning environment. *J Med Educ* 1978;53:98-104.

41. Clarke RM, Feleti GI, Engel CE. Student perceptions of the learning environment in a new medical school. *Med Educ* 1984;18(5):321-5.
42. Letizia M, Jennrich J. Development and testing of the Clinical Post-Conference Learning Environment survey. *J Prof Nurs* 1998;14(4):206-13.
43. Chan DS. Validation of the Clinical Learning Environment Inventory. *West J Nurs Res* 2003;25(5):519-32.
44. Al-Hazimi A, Zaini R, Al-Hyiani A, Hasson N, et al. Educational environment in traditional and innovative medical schools: a study in four undergraduate medical schools. *Educ Health* 2004;17(2):192-203.
45. Al-Hazimi A, Al-Hyiani A, Roff S. Perceptions of the educational environment of the medical school in King Abdul Aziz University, Saudia Arabia. *Med Teach* 2004;26(6):570-3.
46. Pololi L, Price J. Validation and use of an instrument to measure the learning environment as perceived by medical students. *Teach Learn Med* 2000;12(4):201-7.
47. Rothman AI, Ayoade F. The development of a learning environment: a questionnaire for use in curriculum evaluation. *J Med Educ* 1970;45:754-9.
48. Feleti GI, Clarke RM. Construct validity of a learning environment survey for medical schools. *Educ Psych Measurement* 1981;41:875-82.
49. Feleti GI, Clarke RM. Review of the psychometric properties of the Medical School Learning Environment Survey. *Med Educ* 1981;15:92-6.