# ORIGINAL ARTICLE

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Dates:

Accepted 23 June 2009

#### To cite this article:

*Int J Dent Hygiene* **8**, 2010; 134–142 DOI: 10.1111/j.1601-5037.2009.00411.x Saito A, Sunell S, Rucker L, Wilson M, Sato Y, Cathcart G. Learning climate in dental hygiene education: a longitudinal case study of a Japanese and Canadian programme.

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# Learning climate in dental hygiene education: a longitudinal case study of a Japanese and Canadian programme

Abstract: Educational climates have been found to have important influences on learning, but little feedback has been obtained from dental hygiene students. The purpose of this study was to gain an understanding of the learning climate in Japanese and Canadian dental hygiene programmes for the purpose of making positive changes. A survey instrument with 10 dimensions relating to learning climate was adapted from business and dental models, and designated as the Dental Hygiene Student Learning Climate Survey (DHS-LCS). Higher scores indicated a more positive and supportive learning climate, and lower scores indicated an environment that is potentially less desirable. Students enrolled in a Japanese and a Canadian dental hygiene programme participated in this four-year study from 2005 to 2008. A total of 402 surveys were returned for an average response rate of 62%. The mean total DHS-LCS score of Canadian students was statistically significantly higher than that of Japanese students (P < 0.001) in all years tested, indicating that the Canadian students' perceptions of their learning environment were more favourable than those of the Japanese students. Based on the analyses of the DHS-LCS data, interventions to improve learning climates were designed and implemented. There were statistically significant improvements (P < 0.01) in DHS-LCS scores of Japanese and Canadian students over the years of the study, suggesting that student-centred interventions improved the perceived learning environment. The instrument appears to be helpful in identifying student concerns and can be used to implement interventions to help support a healthier learning climate.

**Key words:** dental hygiene education; learning climate; learning environment; student-centred education; survey instrument

#### Introduction

Internationally, there is a trend for increased length in dental hygiene entry-to-practice programmes (1). There has been a 100% increase in the number of countries with baccalaureate programmes 1998 to 2006, and several other countries are working towards baccalaureate education as the entry-to-practice credential.

Current Japanese dental hygiene education has been rapidly expanding towards 3-year associate or 4-year baccalaureate degrees to meet the diverse needs of society (2, 3). The increase in the length of basic education is expected to help Japanese dental hygiene to evolve into a highly skilled profession with an increased academic orientation.

In Canada, current dental hygiene education is even more eclectic (4); programmes vary in prerequisites, in length and in institutional setting. They range from 2- and 3-year diploma programmes to 4-year baccalaureate programmes. Entry-topractice in all Canadian provinces and territories occurs at the diploma level, although the Canadian Dental Hygienists Association has a long-standing policy statement supporting baccalaureate degree as the entry-to-practice credential (5).

In Canada, as well as in Japan, education has been viewed as an important attribute to promote professional development (6-8). However, the sheer volume of knowledge and the different abilities required for dental hygiene practice do create challenges within educational programmes (9). It has resulted in programmes with compressed curriculum given that legislative changes for increased length of dental hygiene education have often lagged behind curriculum changes. In addition, times of fiscal restraint in higher education have resulted in further difficulties within dental hygiene education. In essence, many dental hygiene programmes are in a state of flux and transformation; this was the case in 2004 when the two programmes involved in our study, the Miyagi Advanced Dental Hygienist College (MADH) in Sendai, Japan and Vancouver Community College in Vancouver, Canada, initiated an international exchange programme (3).

The term learning climate refers to 'the tone or atmosphere' of the learning environment (10). Genn (11) describes it as the 'the soul and spirit ... of the educational environment and curriculum.' It is the perception of the environment that is central to the term climate (11–13). Climate is not about the environment *per se*; it is about perceptions of the environment, how people respond to the environment (14). It is also different from the concept of culture that implies shared beliefs, while climate is based on individual perceptions. However, Genn (11) emphasizes the usefulness and power of climate in analysing dimensions surrounding the educational environment.

In the dental education community, there is a long-standing perception that students experience stress related to a variety of environmental factors during their dental education (15–22). In nursing (23, 24) as well as medical education (11, 13), a supportive learning environment is considered to be of paramount importance to the development of required knowledge and abilities. While there have been many discussions about the amelioration of dental hygiene education, they have largely focused on curriculum content and outcomes (25–29). The views of dental hygiene students have often been overlooked.

Learning environments have been found to affect many areas including academic achievement (30, 31), motivation to learn (32), self-confidence (33, 34), capacity for critical thinking (35) and overall moral (22). Hence, it is important to gain an overall understanding of this environment. Evaluations of individual courses and faculty are commonly used to identify strengths and weaknesses of courses, but may fail to address other important educational issues as they do not ask for reflections about the overall curricular experience and entire learning environment within the programme (19, 36). Thus, negative perceptions may go unnoticed despite a systematic approach to the evaluation of all courses; these could have consequences for student performance within the programme as well as their satisfaction with the profession they are entering. Students are often disappointed to discover that the feedback they have provided in course evaluations do not result in any change. It appears that dental faculties tend to use scores on standardized tests as a reflection of educational quality, rather than student perspectives (37).

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 programme. Learning climate research became a major line of inquiry in higher education as health educators developed interest in exploring students' opinions about their learning experiences (19). The Medical School Learning Environment Survey (MSLES) (38) was the catalyst for a number of instruments developed to explore the unique environment of health professions. The MSLES spawned a number of similar assessment instruments including the Clinical Learning Environment Inventory (24) in nursing education, the Dundee Ready Education Environment Measure (DREEM) in medical education (39, 40), Dental Student Learning Environment Survey (DSLES) in dental education (19). These instruments contain a number of items ranging from 50 (40) to 55 (19) clustered into domains. This makes them more complex instruments to

implement particularly in the context of language and cultural difference as in our case involving Japanese and Canadian dental hygiene programmes. However, an instrument adapted from the business world (36, 41) provided an interesting option based on 10 dimension of learning. It was implemented at the University of Alberta with their dental hygiene and dentistry students during a time of change to bring about positive change in the clinical and laboratory environments. It contained some similar dimensions to the other instruments, yet also included dimensions related to value placed on ideas, respect and standards that were considered important in the culture of dental hygiene education.

The focus of this study was directed to gain a greater understanding of dental hygiene students' perception of their learning environment. We were interested in further exploring the learning climate in dental hygiene programmes through a longitudinal study that allowed for the implementation of interventions to support learning. As cultural and environmental differences influence the way people think (42), we also wished to compare the perceptions of Japanese and Canadian students regarding their dental hygiene education.

#### Methods

#### Study population

The target sample for this four-year study included the dental hygiene students from 2005 to 2008 at VCC, Vancouver, Canada and at MADH in Sendai, Japan. The second and third year students were selected to gain an appropriate cross section of dental hygiene students. This decision was also based on a curricular issue; the first year curriculum in British Columbia can be taken in various post-secondary organizations across the province and was, therefore, not under the administrative control of VCC. Both groups were experiencing major changes in their curriculum based on previous review processes.

#### Instrument

The survey design was based on a business model 'Learning Habit Questionnaire'(41) and on its author-approved adaptation to a dental version implemented at the University of Alberta (36). It was designed to measure how well organizations encourage the learning habit. The instrument was then modified to reflect the overall education environment as opposed to a clinical and laboratory context. This was necessary given the fact that clinical experiences are offered in a

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number of off-site locations for the MADH students. The instrument included the following dimensions (Table 1): Physical environment, Learning resources, Encouragement to learn, Communication, Rewards, Value place upon ideas, Practical help available, Warmth and Support, Standards and Respect. The communication dimension was further subdivided into three categories based upon possible communication channels between (i) Student to student, (ii) Student to faculty and (iii) Student to staff.

A 7-point scale was used to rate each dimension with '1' being very poor and '7' being excellent. Higher scores indicated a more positive and supportive learning climate, and lower scores indicated an environment that is potentially less desirable. The participants were also encouraged to provide written comments that would be helpful for a better understanding of learning climate.

The translation process involved forward and back-translations (23, 43) of the modified instrument for equivalence. MADH faculty members, one dentist and one dental hygienist performed forward translations into Japanese. A panel of three dental hygiene faculty members completed a copy of the translated questionnaire, and the results were evaluated to identify any errors or potential language difficulties. The Japanese version was then translated back to English. Both Japanese and Canadian faculty members were consulted to identify discrepancies, and adjustments were made for inconsistencies. Then both versions were pilot-tested on graduating MADH and VCC third year students of 2005 (n = 87)for content validity and internal consistency reliability. The final refined version, Dental Hygiene Student Learning Climate Survey (DHS-LCS), was used in the present investigation.

#### Data collection

The instrument was implemented annually for four consecutive years with the second and third year students. This group was surveyed approximately 2 months before the end of their academic year. In 2005, only the second year students were surveyed. All surveys were anonymous. Institutional ethical approval was obtained from MADH and VCC as well as through the Ethics Board at the Faculty of Dentistry, University of British Columbia.

#### Intervention

The survey results were shared with the students, faculty and staff at the end of each academic year. Through discussions at

#### Table 1. DHS-LCS dimensions, description and examples of scale items

1. Physical environment		
This includes the quality of space and privacy affor available for client care/simulations. Poor conditions; difficult to sustain quality care; difficult for learning	ded to people, the access	ibility of necessary supplies and the equipment and supplies Excellent conditions; no physical barriers to the delivery of quality client care; effective learning spaces
2. Learning resources Numbers, quality and availability of faculty and staf Very few or not available faculty and staff; few and poor resources	f as well as equipment. 1 2 3 4 5 6 7	Many very helpful and available staff and faculty; equipment in good working order and sufficient in number for learners
3. Encouragement to learn The extent to which students feel encouraged to ha may put individual or community clients at risk.	ave ideas and learn new w	ays of doing things. This would not include experimentation that
Little encouragement to learn; there are low expectations of people in terms of new abilities	1234567	themselves and their knowledge
4. Communications This refers to the pathways of information flow from the flow of information? Do people express ideas Information is not openly shared; sometimes discouraged from seeking assistance or information	student to student, studer and opinions easily and op 1 2 3 4 5 6 7	nt to staff and student to faculty member. How open and free is penly? Students are openly willing to pass information and provide assistance
5. Rewards This includes students being verbally praised for the rather addresses positive verbal reinforcement and Students are ignored but blamed first if things go wrong	eir efforts, being given rec d recognition of excellence 1 2 3 4 5 6 7	ognition for good work. This does not include grading but in clinical and community performance. Students are openly recognized for good work and rewarded for effort and learning
6. Value placed on ideas The extent to which ideas, opinions and suggestion Ideas are not sought or valued from students	ns are sought out, encoura 1 2 3 4 5 6 7	ged and valued. Efforts are made to get students to participate in meetings; ideas are valued and acted upon
7. Practical help available The extent to which students, staff and faculty men People do not help each other; there is an unwillingness to pool or share resources	nbers help each other, offe 1 2 3 4 5 6 7	r support. People are very willing and helpful; pleasure is taken in the success of others
8. Warmth and support This refers to the 'friendliness' of others, the amoun given to students with a problem. Little warmth and support; this is a cold, isolating place	t of trust between students 1 2 3 4 5 6 7	, support staff and faculty members and the amount of support Warm and friendly place; people enjoy being here and working together
9. Standards The emphasis is placed upon quality in all things; p Low standards and quality; no one really seems to care	people set challenging star 1 2 3 4 5 6 7	ndards for themselves and each other. High standards; everyone cares; people reinforce standards
10. Respect This refers to the atmosphere in which learning take Little respect; hierarchical distinctions are constantly made and reinforced	es place, whether students 1 2 3 4 5 6 7	feel respected as human beings. Students are well respected for their knowledge and abilities

DHS-LCS, Dental Hygiene Student Learning Climate Survey.

meetings with students and faculty, interventions were designed to positively influence the learning environment. The effect of the implemented interventions was evaluated through the subsequent surveys.

#### Data analysis

The internal consistency of the instrument was examined using Cronbach's alpha, using SPSS Version 12.0J for Windows

(SPSS, Japan, Tokyo). InStat version 3.05 for Windows (Graph-Pad Software, La Jolla, CA, USA) was used to analyse the quantitative data. Non-parametric tests were used to compare differences between groups. *P*-values less than 0.01 were considered statistically significant.

Thematic and discrepancy analysis (44) was used to explore the text-based data from the open-ended question. The data were coded, categorized and organized into meaningful themes.

#### Results

The instrument showed adequate internal consistency (Cronbach's coefficients ranging from 0.88 to 0.94). The response rate for the VCC group ranged from 43% to 55%, while the MADH response rate ranged from 65% to 97% for a mean response rate of 62%. A total of 402 surveys were returned over the years of its implementation.

The scores on the dimensions for the VCC group ranged from a low of 4.11 to a high of 6.55 (Table 2). A great majority of the dimensions were rated over 5 with only two items being rated between 4 and 5; these two dimensions included the physical environment and learning resources. The scores on the dimensions for the MADH students ranged from 3.29 to 5.33. The great majority of the dimensions was rated between 3 and 4. The highest scores in the dimensions related to 'Student to student' communication with that dimension being the only dimension receiving a score of 5 or higher. In both the VCC and the MADH responses, the 'Student to student' dimension was rated higher than the 'Student to faculty' or 'Student to staff' dimensions.

When the total group scores of all dimensions were compared, there were statistically significant differences (P < 0.001) between VCC and MADH responses (Table 2). The overall mean of the VCC group score was significantly higher than that of the MADH group in every year surveyed. In 2005, the scores of VCC students for all dimensions except for 'Physical environment' and 'Student to student' communication were significantly higher (P < 0.001) than those of MADH students. In 2006, 'Student to student' communication was the only dimension without significant differences in scores.

For the differences between the students as they progressed from year to year, the views of the VCC students did not change from their second year to third year. For the second year MADH students, scores for 'Respect' and 'Rewards' were the lowest, whereas the third year students gave 'Learning resources' and 'Student to faculty' communications poor ratings (data not shown).

Several recurrent themes were identified in the text-based analysis (Table 3). Although the similarities outweighed the differences in their comments, some variations did exist (Table 4). For instance, in 'Communication', the VCC students focused on the information flow with regard to the kind of communications that occurred. The MADH students focused on the amount of communication between faculty and students. The issue of some students receiving more information or more attention was common to both groups. Both

	2005 VCC ( <i>n</i> = 12; 55%)	2006		2007		2008		
Dimensions		MADH ( <i>n</i> = 68; 97%)	VCC ( <i>n</i> = 18; 43%)	MADH ( <i>n</i> = 90; 69%)	VCC ( <i>n</i> = 19; 46%)	MADH ( <i>n</i> = 85; 66%)	VCC ( <i>n</i> = 29; 54%)	MADH ( <i>n</i> = 81; 65%)
Physical environment	4.75	4.28	4.83	3.93*	5.84*	4.60	5.48*	4.86
Learning resources	4.58*	3.43	4.11	3.52*	5.21*	3.96	5.21*	3.52
Encouragement to learn	5.92*	3.94	5.11	3.98*	5.89*	4.15	6.55*	4.19
Communications								
Student to student	5.58	5.33	5.67	5.28	6.32*	5.16	6.10*	5.65
Student to staff	5.25*	3.42	5.17*	3.42	5.89*	4.15	6.03*	4.15
Student to faculty	5.36*	3.56	4.83*	3.38	5.68*	4.07	5.93*	3.82
Rewards	5.42*	3.58	5.11*	3.46	5.68*	4.00	5.93*	3.95
Value placed on ideas	5.17*	3.50	5.35*	3.60	5.37*	3.84	6.00*	4.02
Practical help available	5.83*	3.76	5.67*	3.89	5.95*	4.31	6.28*	4.31
Warmth and support	5.67*	3.90	5.89*	3.84	5.89*	4.41	6.17*	4.20
Standards	6.00*	3.97	6.22*	3.86	6.47*	4.27	6.48*	4.31
Respect	5.42	3.29*	5.50*	3.67	5.63*	3.85	6.10*	4.13
Total	64.95*	45.96	63.46*	45.83	69.82*	50.77 <sup>†</sup>	72.64* <sup>†</sup>	51.11 <sup>†</sup>

Table 2. Summary of group mean scores related to dimensions measured in the Dental Hygiene Student Learning Climate Survey

\*Statistically significantly different from MADH score in the same year (*P* < 0.001, Mann–Whitney *U*-test); <sup>†</sup>statistically significantly different from 2005, 2006 (*P* < 0.01, Kruskal–Wallis test with Dunn Post-test).

Communication between students and faculty/staff Faculty performance/calibration Number of faculty/accessibility of faculty Physical environment/equipment Student workload Organization (organization of clinical time/evaluations in general)

# Table 4. Examples of different/unique views identified from individual comments

Category	VCC	MADH
Communication	Focused on the information flow with regard to the kind of communications	Focused on the amount of communication between faculty and students
Faculty accessibility	Pertained specifically to treatment plans and clinical assistance	Focused more on support for the development of their clinical technical abilities

#### Table 5. Interventions to improve learning climate

Programme	Interventions
VCC	Improvement of intranet to facilitate communication Reorganizing clinical faculty members for clinics Additional calibration exercises for clinical faculty Improvement of physical working space conditions Development of a plan of action for creating self-directed learners
MADH	Establishment of the student support centre (placement of school counsellors) Downsizing the student enrolment Increased time for clinical skill training and utilization of clinical dental hygienists as part-time instructors Introduction of active learning strategies (e.g. formal debate) Improvement of the library, guidance for other resources available (e.g. dental school library) Increased opportunities for learning support

groups requested more faculty; the VCC students directed attention to more faculty treatment planning, while the MADH students focused on faculty in the context of developing their clinical technical abilities. This information was used to help support the development of interventions.

A number of interventions were generated to improve the learning climate (Table 5). The VCC faculty worked with their administration to obtain more locker and classroom space for the students. As well negotiations occurred with the librarians to provide increased access to indexes and journals through internet options. The clinical faculty issues were also discussed and plans made to decrease the paper work that appeared to be affecting the treatment planning process and the clinical



*Fig. 1.* Distribution of the DHS-LCS score of MADH students for 'Respect'. DHS-LCS, Dental Hygiene Student Learning Climate Survey.



*Fig. 2.* Distribution of the DHS-LCS score of VCC students for 'Learning resources'.

support available for students. At MADH, a college counselling service was established for the students. The MADH faculty worked with their administration to downsize the enrolment to improve faculty to student ratio.

To evaluate the effects of these interventions, results from the subsequent surveys were compared and analysed. For both VCC and MADH students, the trend that developed following the first year of surveying was generally a positive one. Combined ratings of the second and third year VCC and MADH students showed significant improvements over time (Table 2). When the profiles of dimensions with low ratings in 2005 or 2006 were analysed, the trend for improvements could be confirmed by the general shift to higher scores (Figs 1 and 2).

## Discussion

This study was undertaken to provide a better understanding of the learning climate in dental hygiene programmes and perhaps provide an instrument that could be used to help improve the learning climate in such programmes. We believe that this study is unique in its focus on assessing the general learning environment in dental hygiene education including a longitudinal and international perspective.

The overall response rate and the respondents' written comments in the survey suggest that many students were interested in expressing their views about their learning climate. They became engaged in discussions to help find solutions to the issues that were raised. The dialogue that was generated between faculty, students and staff may be the most valuable aspect of the survey instrument. The discussions went beyond individual courses and explored broader issues affecting their learning. Such discussions could, of course, be equally stimulated by other instruments as well. However, this study does suggest that a general instrument to explore the learning climate can be helpful in bringing about positive change. It supports the need to go beyond individual course evaluations, as it is so often the case in educational programmes. Discussions with faculty members revealed that the instrument was perceived as being non-threatening to them given that it had a broad focus. It may have resulted in increased willingness of faculty members to explore issues given the shared responsibility for the ratings.

In this study, the mean total DHS-LCS score of Canadian students was significantly higher than that of Japanese students. There may be several reasons for this difference. Faculty to student ratio is thought to be one of the most significant factors. This was evident in students' comments. The faculty to student ratio for VCC was on the average 1 to 5, whereas that for MADH was 1 to 28. Although both VCC and MADH students requested more faculty members, it can be assumed that the VCC students received closer attention from faculty members, thus contributing to the better communications.

A cross-cultural comparison study with dental students in Canada, Thailand and Japan found that nearly three-quarters of the Canadian and Thai students were satisfied with the teaching faculty of their schools, while only a quarter of the Japanese students indicated satisfaction (45). Our study seems to suggest a similar trend with dental hygiene students. However, it is challenging to determine the source of this difference; it may be a reflection of cultural influence but could also reflect other environmental factors.

In a previous study of the 2006 MADH and VCC students, a difference was found in the perceptions of their profession (46). Canadian dental hygiene students demonstrated higher levels of motivation and expectation toward their profession when compared with Japanese students. Moreover, their level of explicit self-esteem was significantly higher than that of the Japanese students, and it was positively correlated with their expectations of the profession. Thus, in addition to aforementioned factors, differences in the professional environment surrounding dental hygiene may also affect students' perceptions on their learning.

Students' age or maturity may be another factor that could account for differences in their responses. The Canadian students were approximately 6 years older than the Japanese students of the same academic year. Burnard *et al.* (47) studied nursing students' self-esteem and showed that younger students had a higher perception of the quality of their relationship with their peers. Age may have affected their responses to other variables as well given that they may have different expectations of a learning environment. However, age was not a question asked on the survey, so we were not able to explore this issue further.

As Wilson and Deane (36) suggest, asking about dimensions of learning rather than people may be a more effective way to gain constructive feedback about the educational environment. It is important to gain students' perspectives in a way that allows them to express their views about their overall experiences within a programme, and this is particularly true for professional programmes that are known for their stressful learning environments involving services provided to clients. There are no simple answers to the complex issue of a positive learning climate. However, we still need to tackle these issues. An instrument such as the one used in this study has potential to provide some valuable feedback to illuminate general dimensions of the learning environment. Shedding some light on such dimensions can help to bring about further discussions and student-centred interventions.

The interventions in our study appear to have contributed to the improvement of the learning environment in both organizations as assessed by the changes in the DHS-LCS scores, but the interventions are of course context specific. They need to be negotiated with students in their unique learning environments.

There are limitations in this study. The response rate by the VCC students was lower than the MADH students; as well the size of the two classes was also different, ranging from 20 to 24 students in the case of VCC, and 58 to 73 students in the MADH group. It is, therefore, challenging to know if the VCC responses were reflective of the class as such or were more indicative of students whose views were more positive of their environment. Even the response rate of the MADH group declined over time; perhaps this is a reflection of the novelty of the survey wearing off over time. Another explanation may be related to possible decrease in faculty interest or commitment over time in introducing the study to students.

Use of any instruments beyond the samples with which they were initially tested presents considerable challenges (48, 49). The DHS-LCS instrument was also developed based on a North American context. Therefore, the validity and equivalence of the Japanese version of the instrument should be further tested in terms of the cultural context. The articulation of dimensions also creates a structure for the dialogues that includes certain aspects, but by its very nature excludes other discussions. What those other discussions may have been we cannot say. However, the range of student comments suggests that the current instrument provided them an opportunity to voice their opinions on a wide range of issues. .

Although this study only focuses on a small number of dental hygiene students, the finding of this study serves to provide some insights into the important aspects of learning climates as perceived by the students themselves. Students are the group that was affected the most by the educational environment, but oftentimes they feel that they have the least amount of input for change (19). The invitation for students to join in this communication may convey the institution's sincere interest in developing strategies that will help to increase students' positive impressions of their dental hygiene learning experience.

# Conclusion

With its limits, this study represents an attempt to understand students' perceptions of their dental hygiene learning climate. The students identified dimensions for improvement in their learning climate, and the interventions arising from the dialogue surrounding the survey results appear to have had a positive influence on the learning climate. The instrument is helpful in identifying general student concerns in their learning environment and can be used to implement studentcentred interventions to help support a healthier learning climate.

## Acknowledgements

We are grateful for the participation of the students in this study.

# Declaration of interest

The authors report no conflicts of interest related to this study.

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