

Online Discussion Boards in Dental Education **Potential and Challenges**

Introduction and Aim:

The new general dental practitioners are facing many professional challenges to meet the oral health needs of the public throughout the twenty-first century and to function as an important member of an efficient and effective health care team¹. This mandate changes in dental educational strategies to help prepare competent dental practitioners for their challenging futures². Incorporating online elements in learning and education have been reported to add a multi-fold benefit that can augment face-to-face teaching. These benefits include; the capacity to increase student engagement, to enhance critical analysis and reflection, and to promote the social construction of knowledge as well as collaborative thinking³. Among these e-learning technologies, the widespread use of asynchronous online discussion boards is a testimony of its pedagogical strength. Despite an increased interest in the use of e-learning to enhance students' learning in dental education, little research has been conducted to justify their pedagogical impact on students' learning. The aim of this study is to focus on online discussion boards as a pedagogical tool in augmenting face-to-face teaching in dental education.

Theoretical Framework:

Studies have varied widely in their methodologies used to assess quality and effectiveness of discussion boards and in its data analysis. After an extensive review of research, Kay (2006)⁴ developed a comprehensive metric for assessing discussion board effectiveness. A multi-component metric was developed which comprised of 12 dimensions including; social learning, cognitive processing, quality of discussion, the initial question in a thread, role of educator, navigation issues, challenges for students, types of users, learning outside of school, and learning performance. Concomitantly, Lowes (2006)⁵ compared different methodologies used to analyze data collected from discussion forums for their insights and feasibility. These methodologies were; network analysis, content analysis, and sequential analysis. All three methods were found to be complementary rather than repetitive, mutually exclusive, or conflicting. However, content analysis was found to be the most potentially rewarding methodology that can provide important insights into why a session on the discussion forum is successful, but it was highly labour intensive. The following study adopted these two methodologies, the assessment metric tool and the content analysis, in evaluating the quality and effectiveness of discussion boards in dental education.

Material and Method:

Procedure

Data were collected from a discussion archive offered through the E-course website of the School of Dentistry, University of Birmingham, UK in 2008. Participation in the online discussion was made for voluntary use by both students and instructors with no grading criteria.

Assessment tool:

A multi-component metric, comprising of 5 dimensions, was created. The metric and the specific variables used to assess these dimensions are listed in Table 1 below.

Table 1. Dimensions, variables and ratings designed to analyze discussion board threads and messages

Dimensions	Variables used	Rating
Participation (Overall)	1. Total number of threads and messages	Frequencies and percentages
	2. Number of posted threads and messages / term	Frequencies and percentages
	3. Length of discussion thread	Mean
	4. Number of words / message	Mean
	5. Types of users ⁴	1.Instructor, 2.Student
Quality of discussion (Overall)	1. Message clarity ⁴	1.Unclear, 2.Somewhat clear, 3.Clear
	2. Content type in message ⁴	1.Social comment, 2.Course unrelated, 3.Administrative, 4.Course related
	3. Author of initial question	1.Instructor, 2.Student.
	4. External resources used ⁴	1.None, 2.Teacher/course information, 3.Another message, 4.Web, 5.Book, 6.Article, 7.e-course page, 8.past-exams, 9.coursework, 10.more than one resource
	5. Response time ⁴	Mean
	6. Resolution of discussion threads ⁴	1.Unresolved, 2.Partially resolved, 3.Completely resolved.
Social learning (messages posted in the 3 rd term only)	1. Number of threads with more than four messages	Frequencies and percentages
	2. Primary purpose of posted messages ⁴	1.Open question, 2.Specific question, 3.reply, 4.reply followed by an action, 5. Independent comments, 6. Non-academic issues
	3. Students' interaction level ⁶	1.Independent thinking, 2.Interactive thinking
Cognitive processing (messages posted in the 3 rd term only)	1. Knowledge type ⁴	1.Fact, 2.Concept, 3.Procedure, 4.Meta-cognitive
	2. Processing level ⁴	1.Remember, 2.Understand, 3.Apply, 4.Analyze, 5.Evaluate
Role of educator (messages posted in the 3 rd term only)	Instructor messages were compared in threads with =>4 messages vs. threads with<4 messages for the following;	
	1. Primary purpose of posted messages	As above
	2. External resources used	As above

Statistical Analysis

Data were coded using content analysis method and a complete message as the unit of analysis. Intra-examiner reliability was assessed for the variables coded using Kappa statistics. These variables are; message clarity, content type, external resources used, resolution of discussion threads, primary purpose of posted messages, students' interaction level, knowledge type and processing level. Results were then analyzed using SPSS for descriptive and inferential statistics with significant levels set at $p < 0.05$.

Results:

Intra-examiner reliability test:

After repeated measures, the final Kappa statistical value ranges from (0.9 to 1) for the coded variables, thus, indicating high agreement levels.

Participation:

A total of 108 threads consisting of 330 messages were posted by both instructors and undergraduate dental students with no significant participation difference ($p < 0.05$). However, when the latter group was further analyzed, Kruskal-Wallis test (Asymptotic significant value=0.000) reveals that there is a significant difference ($p < 0.05$) between the number of posted messages by the students from different undergraduate level. The majority of messages ($n=146/176$) were posted by 4th year undergraduate students (BDS4) (Figure 1).

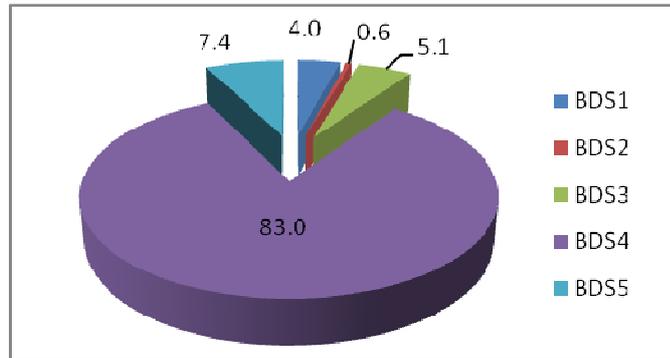


Figure 1. Percentages of messages posted by students from different undergraduate level; BDS1 (1st year), BDS2 (2nd year), BDS3 (3rd year), BDS4 (4th year), and BDS5 (5th year).

A majority of messages ($n=255/330$, 77.3% messages, 79/108 threads) were posted in the 3rd term (Figure 2). The mean length of a discussion thread consisted of 3 messages (SD=2.3, range 1-15 messages). The mean number of words per message was 53.5 words (SD=56.9, range 1-464 words).

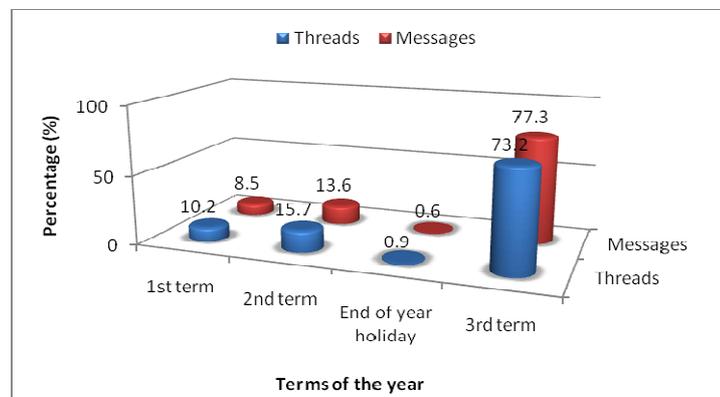


Figure 2. Percentages of threads and messages posted in the 1st, 2nd, 3rd terms and end of year holiday in 2008.

Quality of discussion

Posted messages were mostly clear (315/330 messages), with course-related information (261/330 messages). All threads (100%) were student initiated and discussion issues were mostly completely resolved (84/108 threads). A majority of the messages ($n=266/330$, 80.6%) had no reference to any external resources (Figure 3).

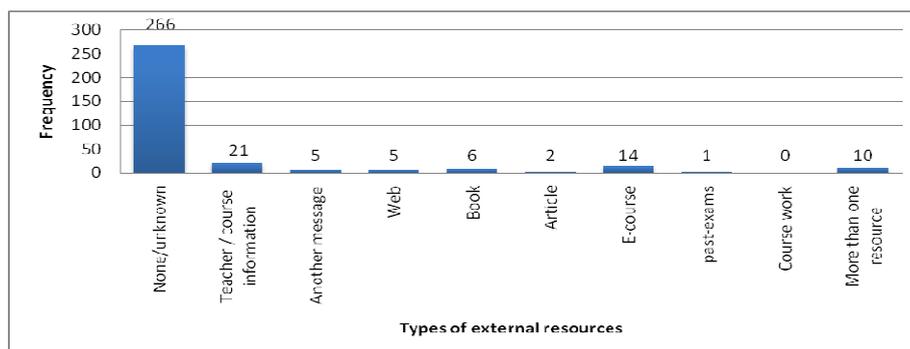


Figure 3. Frequencies of posted messages using different types of external resources; none/unknown, teacher/course information, another message, web page, book, article, e-course page, past-exam paper, coursework and more than one resource.

After eliminating the outliers (e.g. response time greater than 20 days, $n=2$ messages), the mean response time in the 222/330 messages was found to be 0.85 days ($SD=2.4$, range 0-19 days).

Social learning

The number of threads containing four or more messages in the 3rd term were ($n=23/79$, 29.1% threads, and the number of messages in those threads was ($n=137/255$, 53.7%). Social interaction with peers in those threads appeared only through students posting messages with open questions (27/135 messages). Peer interaction, where students replied to other's messages, appeared in only (10/135) messages (Table 2).

Table 2. Pivot table showing the frequencies of students' posted messages using the following variables; students' interaction level, primary purpose of posted message and threads' length.

Primary purpose of posted messages	Students' interaction level				Total
	Independent thinking		Interactive thinking		
	Thread with <4 messages	Thread with \Rightarrow 4 messages	Thread with <4 messages	Thread with \Rightarrow 4 messages	
Open question	0	0	38	27	65
Specific question	6	10	0	0	16
Reply	0	9	1	3	13
Reply followed by action	0	3	1	7	11
Independent comment	6	8	8	2	24
Non-academic issue	2	0	2	2	6
Total	14	30	50	41	135

Cognitive processing

Pearson Chi-Square test (Asymptotic significant value=0.000) reveals that there is a significant association ($p<0.05$) between the knowledge type and the processing level of the contents in students' messages. Students were mainly trying to understand concepts ($n=27/102$, 26.5% messages), followed by applying procedures ($n=17/102$, 16.7% messages), remembering facts ($n=11/102$, 10.8% messages), evaluating meta-cognitive knowledge ($n=9/102$, 8.8% messages), and analyzing procedural and meta-cognitive knowledge ($n=7/102$, 6.8% messages) (Table 3).

Table 3. Pivot table showing the frequencies of students' messages posted at different knowledge type and processing level

Knowledge type	Processing level					Total
	Remember	Understand	Apply	Analyze	Evaluate	
Fact	11	6	0	0	0	17
Concept	2	27	1	4	0	34
Procedure	0	3	17	7	1	28
Metacognitive	1	2	4	7	9	23
Total	14	38	22	18	10	102

Role of educator

Instructors were mainly replying to students' messages with (49/120 messages) or without (54/120 messages) proposing another action. However, when the latter group where further analyzed, Pearson Chi-Square test (Asymptotic significant value=0.014) reveals that there is a significant association ($p < 0.05$) between the action taken by instructors in their posted messages and the length of discussion threads. The number of messages with reply followed by a question was significantly higher in threads with 4 or messages (18/24 messages). The number of messages with reply followed by a referral to external resources was significantly higher in threads with less than 4 messages (14/21 messages) (Table 4).

Table 4. Pivot table showing the frequencies of instructors' messages posted using the following variables; types of action in reply messages and threads' length.

Primary purpose	Threads' length		Total
	Threads < 4 messages	Threads => 4 messages	
Reply followed by a question	6	18	24
Reply followed by a referral to an external resource	14	7	21
Reply followed by both a question and referral to an external resource	1	3	4
Total	21	28	49

Discussion and Conclusion:

Results suggest that both the technology and our technological literacy have evolved to a point where asynchronous online environments can support and augment teaching and learning in dental education. Extensive use of the discussion board by students highlights its significance and pedagogical strength. In consistence with previous findings, the pattern of students and instructors interaction shows the substantial alteration in roles with learner centricity approach⁷. Two challenges are found to insure successful incorporation of online discussion boards in dental education. These challenges are teacher development and curriculum design. Further development of instructor's knowledge in using discussion boards to its full pedagogical potential is needed to insure higher level and collaborative thinking among students. Incorporating online technology has changed the learning environment, thus, different learning outcomes would be expected. This mandates re-evaluation of curriculum design to insure alignment of learning goals, learning activities, and feedback and evaluation.

The findings of this study will help to provide evidence-based research that highlights specific pedagogies and their association and impact on students' learning in dental education, which will in turn, guide us to further inquiry in the field.

References

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