

Challenges in Learning Basics of Dental Materials: Perceptions of 1st Year Saudi Dental Undergraduates and their Concerns

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DOI: [10.36348/sjodr.2021.v06i10.005](https://doi.org/10.36348/sjodr.2021.v06i10.005)

| Received: 25.08.2021 | Accepted: 12.10.2021 | Published: 20.10.2021

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Abstract

Despite the abundance of scientific textbooks, references, and educational websites, students in the 1st year of the bachelor of dental surgery (BDS) program face some academic challenges. Distress, learning difficulties, and study discontinuation are all possible outcomes of these challenges. The present study was motivated by the scarcity of literature pertaining to the obstacles faced by the 1st year dental students in learning and understanding dental materials courses, and other difficulties, which students encounter during their foundation year, BDS 1st year. A questionnaire was prepared and distributed among undergraduate students at different levels of study year of the BDS program. Six different year study levels were chosen for the current study; the total number of participants was 111. Statistical analysis (chi-square test) was performed on the data collected, using SPSS version 20.0 software. Results showed complete agreement on most areas of difficulties the students encountered during their BDS 1st year study. The majority of the examined students were of the opinion that the difficulties they encountered in their BDS 1st year were not due to one certain subject, such as dental materials courses, but rather because of a collection of overlapping factors that contributed to study difficulties, thereby amplifying their impact on the study and comprehension of dental materials courses. In addition, the examined students showed more interest and eagerness towards acquiring more knowledge of dental materials, particularly towards dental materials II (clinical dental materials). Students consider dental materials courses as a basic introduction to the field of dentistry; besides, a thorough understanding of its various uses is a key factor in excellence in the dentistry field.

Keywords: BDS 1st year, dental materials, study difficulties, academic challenges, dental undergraduates.

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INTRODUCTION

The worldwide trend of ensuring the quality of education is a fundamental demand that education experts have sought for a long time [1]. The pursuit of feedback and assessing participants' satisfaction receives greater attention; it is thought to play an integral role in the quality assurance of education [2]. Students, as direct beneficiaries of the educational process, are regarded as key participants and a valuable resource for a variety of statistical and applied information [3]. Curriculum designers should make use of this vital resource to assess issues with course management and implementation. Strategic emphasis on education focusing on students suggests that students' understanding of their educational environment is critical [4].

In fact, the essence of the interaction between a student and a teacher depends primarily on the skills of the teacher, on whom much depends regarding the educational process [5]. The successful educational process starts with a teacher, who is primarily responsible for highlighting the significance of what is being presented, and then comes his role in providing a smooth and simple scientific material that helps students in the cognitive process [6]. This undoubtedly is a key factor in overcoming study difficulties whose consequences many junior students suffer from [7].

Students in the 1st year bachelor of dental surgery (BDS) study face academic challenges and difficulties that require attention [8]. Generally, the importance of the 1st year study lies in the fact that it constitutes the basic infrastructure that facilitates the process of the entire study field. In addition, it builds

basic learning skills along with developing and improving educational capabilities. In this foundation year, and more importantly, students are taught the basic skills of university learning; the idea lies in that students proceed from the traditional way of learning in the pre-university stage (secondary school) to high/professional university education [9]. This transition process, although can be accompanied by obstacles, is necessary to assist students acclimatize to their new study environment. Despite the fact that students are naturally presented with different intellectual capabilities, such transition may still cause some difficulties for the majority of students [10].

In the 1st year in dental school, students are taught the basic foundational sciences of dentistry that enable them to construct their 1st essential building block in understanding dentistry. Certain fundamental courses, such as dental biomaterials, dental anatomy, physiology, anatomy, histology, biochemistry, and behavioral science and ethics of dentistry are the courses that are taught in the 1st year BDS study worldwide. As an annual based system study, and like most dental schools around the world, these courses are presented in two semesters of the 1st academic year.

An essential foundation course for dentistry, which is intimately related to dental oral rehabilitation and/or treatment, is known as science of dental materials. It is concerned with study of different materials' composition, properties, manipulation, selection and use. Science of dental materials is basic; it deals with physical, mechanical, chemical, and biological properties of dental materials. Learning the characterization of these properties provides a professional dental operator with the basic knowledge that assists not only in choosing the right material in different clinical situations but also in dealing with shortcomings of these materials in an effective manner. As a subject, the dental materials course requires in-depth understanding of the nature, structure, and properties of materials, along with sufficient knowledge for their application in every aspect of clinical practice. Basic theoretical knowledge, via didactic lectures, along with sufficient laboratory classes as well as clinical sessions are required. Certainly, for a successful study of dental materials courses, immense efforts from teachers as well as students are mandatory to ensure appropriate learning and thorough understanding. As the backbone of dentistry, thorough knowledge of dental materials sciences and applications is an essential factor to a successful dental practice [11].

Many dental undergraduate students at their 1st year BDS study are afflicted with some obstacles and difficulties in studying dental materials courses. The challenges in studying such courses may look overwhelming to the novice, as there are so many resources to study, some of which are entirely distinct, while others appear to be so similar as to be

incomprehensible. Soratur S. H., a well-known expert fellow in the field of dental materials and the author of the book *Essential of Dental Materials* stated that, after teaching dental materials courses for more than 22 years, getting students to transition from a pre-university to a professional dental course, such dental biomaterials, is a difficult endeavor [12]. Manappallil J. J., another dental materials book author stated "dental materials can appear quite dry and intimidating" [11]. A probable reason for such assumption is the fact that the science of dental materials requires immense theoretical knowledge along with various technical details.

After a rigorous review of the literature, no studies were found that addressed the perception of the 1st year BDS students regarding the underlying factors of possible difficulties encountered during the study of dental materials courses. Therefore, the current cross-sectional study aimed primarily at analyzing the difficulties experienced by dental students in understanding dental materials courses and evaluating their general perceptions of learning difficulties during their BDS 1st year study.

MATERIALS AND METHODS

This research project was approved by the Research and Ethics Committee of the Faculty of Dentistry, Najran University, Kingdom of Saudi Arabia (KSA). The research project approval number is 004/18 (August 15, 2018). Perceptions and data collections, performed in the current study, were as per the ethical standards of the institutional and/or national research committee and the Helsinki declaration, as amended by the 64th WMA General Assembly, Fortaleza, Brazil, October 2013, and its later amendments or comparable ethical standards.

This current descriptive cross-sectional study was conducted at the department of Restorative Dental Sciences, Faculty of Dentistry, Najran University, KSA. The bachelor degree of dentistry (BDS) program at the University of Najran, KSA, consists of six years study, in addition to an internship year. Each academic year comprises two semesters. The first year (a preparatory year) has been allocated for basic general sciences and the English language study.

A questionnaire was prepared and distributed among undergraduate students at different levels of a year study of the BDS program. The six different levels of study chosen for the current study are as follows: Level 8, Level 9, Level 10, Level 11, Level 12, and internship year. The questionnaire was piloted, verified, and designed to be close-ended. Cronbach's alpha for test-retest verification was 0.88. The study's aims were explained to all of the participants. Each participant was given a copy of the questionnaire and asked to answer anonymously. Because the present dental program at the University of Najran, KSA, is solely for male students, no female participants were included in the

current study. As a result, the population studied for this study was exclusively male students. The participants of the current study were not identified. Statistical analysis (chi-square test) was performed on the data collected, using SPSS version 25.0 software. Groups, number of participants, questions, chi square, and p-values are provided in Table 1.

RESULTS

This current study used a total of 18 questions to elicit students' perspectives on the challenges they encountered throughout their BDS 1st year; they were given the option to answer yes or no. The questionnaire was completed and returned by all 111 participants. A total of 18 were from level 8, 16 were from level 9, 21 were from level 10, 19 from level 11, 17 from level 12, and 20 from the internship year. While there was significant differences in students' perceptions about only two issues of the study, represented by two questions (Q18 and Q19) ($p < 0.001$), no significant discrepancies in the students' perception, on most areas of difficulties evaluated (16 questions, Q1-Q16) ($p > 0.05$), they encountered during their BDS 1st year study;

p values along with Chi square results are provided in Table 1.

The majority of the students were of the opinion that the difficulties they encountered in their BDS 1st year were not due to one certain subject but rather because of a collection of overlapping factors that contributed to study difficulties, thereby amplifying their impact on the study and comprehension of dental materials courses. Despite being more difficult than dental materials I, all examined groups demonstrated a greater interest in dental materials II. In addition, there was no significant difference in the students' perception related to the understanding of didactic lectures of both courses, dental materials I and dental materials II; students expressed the same ability in understanding both courses. However, their origin of concern, regarding the difficulty in both courses, was reading from English textbooks, where they felt the necessity of translation from English into their native language, Arabic. Students were also keen about other factors they perceived as difficulty sources for their study and accomplishment, such as more courses studied per semester, immense information to learn and memorize, and studying in the English language.

Table 1: Questionnaire for assessing difficulties encountered by BDS 1st year students. Groups, number of participants, questions, answers, chi square, and p-values are also provided

Questions	Answer	Groups						Chi Square	P-value
		G1 (18)	G2 (16)	G3 (21)	G4 (19)	G5 (17)	G6 (20)		
		(Level 8)	Level (9)	(Level 10)	(Level 11)	(Level 12)	(Interns)		
Q1 Dental materials courses are the most difficult courses in my BDS 1 year.	Yes	2 (11.1%)	3 (18.8%)	1 (4.8%)	0 (0.0%)	1 (5.9%)	3 (15.0%)	5.371	0.372
	No	16 (88.9%)	13 (81.3%)	20 (95.2%)	19 (100.0%)	16 (94.1%)	17 (85.0%)		
Q2 Dental materials I course is more difficult to understand than dental materials II course	Yes	0 (0.0%)	0 (0.0%)	1 (4.8%)	0 (0.0%)	2 (11.8%)	2 (10.0%)	5.991	0.307
	No	18 (100.0%)	16 (100.0%)	20 (95.2%)	19 (100.0%)	15 (88.2%)	18 (90.0%)		
Q3 I understand the topics covered in the theory class of both dental material courses	Yes	15 (83.3%)	14 (87.5%)	20 (95.2%)	18 (94.7%)	16 (94.1%)	19 (95.0%)	3.078	0.688
	No	3 (16.7%)	2 (12.5%)	1 (4.8%)	1 (5.3%)	1 (5.9%)	1 (5.0%)		
Q4 The greatest difficulties I encountered in my BDS 1 st year is totally related to courses other than dental materials courses	Yes	16 (88.90%)	13 (81.3%)	20 (95.2%)	19 (100.0%)	17 (100.0%)	19 (95.0%)	7.462	0.188
	No	2 (11.1%)	3 (18.8%)	1 (4.8%)	0 (0.0%)	0 (0.0%)	1 (5.0%)		
Q5 I spent long time during the daily school study, which did not leave me enough time to study at home	Yes	17 (94.4%)	14 (87.5%)	19 (95.5%)	19 (100.0%)	16 (94.1%)	18 (90.0%)	2.666	0.751
	No	1 (5.6%)	2 (12.5%)	2 (9.5%)	0 (0.0%)	1 (5.9%)	2 (10.0%)		
Q6 Number of courses in my BDS 1 st year study is overwhelming	Yes	15 (83.3%)	13 (81.3%)	18 (85.7%)	16 (84.2%)	16 (94.1%)	17 (85.0%)	1.356	0.929
	No	3 (16.7%)	3 (18.8%)	3 (14.3%)	3 (15.8%)	1 (5.9%)	3 (15.0%)		
Q7 I have to study and remember immense amount of information for most courses	Yes	18 (100.0%)	16 (100.0%)	21 (100.0%)	18 (94.7%)	15 (88.2%)	18 (90.0%)	6.107	0.296
	No	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (5.3%)	2 (11.8%)	2 (10.0%)		

Q8 I'm satisfied with the teaching skills of my teachers	Yes	17 (94.4%)	16 (100.0%)	20 (95.2%)	19 (100.0%)	14 (82.4%)	19 (95.0%)	7.007	0.22
	No	1 (5.6%)	0 (0.0%)	1 (4.8%)	0 (0.0%)	3 (17.6%)	1 (5.0%)		
Q9 Teachers deliver lectures with high skills that helped me understand all courses	Yes	15 (83.3%)	16 (100.0%)	19 (90.5%)	16 (84.2%)	15 (88.2%)	17 (85.0%)	3.162	0.675
	No	3 (16.7%)	0 (0.0%)	2 (9.5%)	3 (15.8%)	2 (11.8%)	3 (15.0%)		
Q10 Lectures' presentation and data show facilities are up to my expectation and satisfaction	Yes	18 (100.0%)	16 (100.0%)	20 (95.2%)	18 (94.7%)	17 (100.0%)	19 (95.0%)	2.630	0.757
	No	0 (0.0%)	0 (0.0%)	1 (4.8%)	1 (5.3%)	0 (0.0%)	1 (5.0%)		
Q11 The number of didactic lectures given by teachers is sufficient to provide an in-depth view of all courses	Yes	17 (94.4%)	15 (93.8%)	18 (85.7%)	17 (89.5%)	17 (100.0%)	20 (100.0%)	5.343	0.375
	No	1 (5.6%)	1 (6.3%)	3 (14.3%)	2 (10.5%)	0 (0.0%)	0 (0.0%)		
Q12 Studying in English language is one of the main difficulties I faced in understanding dental materials courses	Yes	16 (88.9%)	14 (87.5%)	17 (81.0%)	17 (89.5%)	15 (88.2%)	18 (90.0%)	1.036	0.96
	No	2 (11.1%)	2 (12.5%)	4 (19.0%)	2 (10.5%)	2 (11.8%)	2 (10.0%)		
Q13 The most difficult part in my BDS 1 st year is studying and memorizing immense information	Yes	18 (100.0%)	15 (93.8%)	17 (81.0%)	17 (89.5%)	15 (88.0%)	19 (95.0%)	5.115	0.402
	No	0 (0.0%)	1 (6.3%)	4 (19.0%)	2 (10.5%)	2 (11.8%)	1 (5.0%)		
Q14 One difficulty in my BDS 1 st year is studying in English language	Yes	17 (94.4%)	14 (87.5%)	18 (85.7%)	19 (100.0%)	14 (82.4%)	18 (90.0%)	4.183	0.523
	No	1 (5.6%)	2 (12.5%)	3 (14.3%)	0 (0.0%)	3 (17.6%)	2 (10.0%)		
Q15 I found it easier and quicker to understand dental material II	Yes	17 (94.4%)	14 (87.5%)	17 (81.0%)	19 (100.0%)	16 (94.1%)	17 (85.0%)	5.446	0.364
	No	1 (5.6%)	2 (12.5%)	4 (19.0%)	0 (0.0%)	1 (5.9%)	3 (15.0%)		
Q16 I found it easier to memorize information of dental material II	Yes	2 (11.1%)	0 (0.0%)	2 (9.5%)	2 (10.5%)	2 (11.8%)	1 (5.0%)	2.400	0.792
	No	16 (88.9%)	16 (100.0%)	19 (90.5%)	17 (89.5%)	15 (88.2%)	19 (95.0%)		
Q17 I'm interested in learning more about dental materials I course	Yes	0 (0.0%)	1 (6.3%)	2 (9.5%)	2 (10.5%)	15 (88.2%)	17 (85.0%)	71.170	0.000
	No	18 (100.0%)	15 (93.8%)	19 (90.5%)	17 (89.5%)	2 (11.8%)	3 (15.0%)		
Q18 I have the same interest in learning more about the two dental materials courses	Yes	0 (0.0%)	0 (0.00%)	1 (4.8%)	0 (0.0%)	15 (88.2%)	18 (90.0%)	89.741	0.000
	No	18 (100.0%)	16 (100.0%)	20 (95.2%)	19 (100.0%)	2 (11.8%)	2 (10.0%)		

DISCUSSION

The six examined groups of the current study had nearly a complete agreement on the basic elements that constituted their main difficulty axes, which they consistently faced during their BDS 1st year. It was interesting to note that students' main concerns did not necessarily originate from difficulties related to one specific subject, such as dental materials courses, but rather were a group of overlapping elements that led to the 1st year BDS study difficulties, thus extending their impact on the study and understanding of dental materials courses and other courses. The main proposed elements that were thought to assign the study difficulties were: (1) number of courses studied in the two semesters of the BDS 1st year and the amount of

information studied in each curricula, (2) factors related to teachers and their capabilities and/or skills in teaching, (3) students' time management, and (4) learning in the English language and its pertinent difficulties.

With respect to the number of courses that are studied in the two semesters of the BDS 1st year, the majority of students found this overwhelming. In fact, students' impression about this was not surprising, especially if this is linked to the immense amount of information of different subjects that must be learned and memorized; this is likely one of the very critical issues that most students, at this educational level, are concerned about. In this sense, each course studied has its own and unique content and requisites that are

needed to be met by students. In order to keep up-to-date, students may feel compelled to immerse themselves in reading books, references, and handouts, from which the difficulty in studying might be originating from [13].

The examined groups agreed entirely that both dental materials courses I and II are significant courses that genuinely contribute to building up their main infrastructure in understanding the dentistry field. Moreover, they have not assigned these courses as the most difficult courses in their BDS 1st year. On the contrary, they showed more interest and eagerness towards acquiring more knowledge of dental materials, particularly in dental materials II, which covers the usage and manipulation of clinical dental materials, such as polymers, impression materials, ceramics, and dental amalgam. One explanation for this is the students' recognition of the subject's importance, as it serves both a fundamental introduction to dentistry and a comprehensive understanding of daily dental practice, involving the use of dental materials. Moreover, the curiosity of most students to explore more about manipulation and the clinical use of clinical dental materials is due to the fact that they consider the insightful understanding of dental materials II (clinical dental materials) and its use as a key factor in the creativity and excellence in dentistry.

It is noteworthy that the participants of the current study agreed mostly on all points correlated to their academic challenges of the BDS 1st year study. Disagreement occurred on only two points: (1) students' more interest in the dental materials I course, and (2) students' equal interest in both dental materials I and II courses. Studying this dispute revealed that it was brought on by senior students, specifically those in the 12th level of study and interns. The students at these higher levels of study may have adequate maturity and knowledge that enable them realize the necessity of learning more about some essential issues associated with their daily clinical practice.

Concerning the difficulty encountered in dental materials I, as listed by some students, this was most likely due to the course's focus on the basic science of matter and its properties, as well as understanding of the various properties that dictate the aesthetic, mechanical, chemical, and physical properties of dental materials. In addition, the difficulty in finding a link between these properties and the actual usage of dental materials in the oral cavity is true. Accordingly, students may suffer from a lack of interest as well as some trouble in comprehending this course. When asked about the source of any difficulty in the dental materials courses, students mostly emphasized the plethora of information that must be learned and memorized, as well as the learning of various terminologies, and different techniques that are involved in the development of dental materials II.

When the difficulty of the two courses was compared, students thought that dental materials II was more difficult than dental materials I. Although this was the case, students demonstrated greater interest towards dental materials II. The increased interest in dental materials II among students is probably due to their perception that creativity in dentistry can begin with a thorough comprehension of this subject and also with competency in dealing with and manipulating these materials in a variety of clinical situations.

The current study's investigated groups identified the English language as one of their study's major challenges, not only in comprehending the two dental materials courses, but also in understanding all other required courses. In reality, this outcome was not surprising. The education system in Saudi mandates learning in the Arabic language at all educational levels (primary, intermediate, and high school). The study continues in the Arabic language in all university disciplines, except for scientific specialties, such as medicine, dentistry, engineering, computer sciences, and some other disciplines. For students indulging in these scientific fields, it is anticipated that the transition from studying in Arabic entirely in their high school to pure English language in the university is challenging. Therefore, students tend to enroll in private English language classes or even move to English speaking countries to learn linguistic skills that help them achieve scholastic ambitions. However, this might be affected by socio-economic statuses, different convictions, and/or circumstances.

Certainly, studying in English language has always been one of the most difficult aspects of learning for the majority of non-native English speakers worldwide [14]. This is despite the fact that many educational institutions around the world have been developing English language educational programs at various levels of primary, secondary, and higher educations to assist learners. Still, the English language remains one of the barriers that hinder many in their learning process in all different learning fields. In one of the Australian universities, poor English proficiency was reported to be associated with impaired performance in medical communication skills [15]. In another study, medical students with English language impediments were assigned to a faculty-based language improvement program for two years [16]. In a cross-sectional study by Almoallim *et al.*, (2017) [17], medical students' perceptions of the learning difficulties during the 1st year study were examined. This study reported that students were dissatisfied with the passive, lecture-based method of teaching and suggested the English language curriculum be improved, with more emphasis on English conversation skills; students also recommended 1st year teachers giving didactic lecture in English and Arabic.

Another difficulty aspect raised by the students of the current study is their inability to adequately manage their time. These students seemed struggling to strike a balance between their studies and their regular daily life. In the BDS 1st year, as a foundation year in dentistry, it is true that most students lack experience in formulating an effective strategy for their study time. Therefore, they initially find it difficult to distribute and allocate their interest, time, and effort among the different courses, considering the fact that some courses require more time to study than others; this is basically related to the nature of these scientific curriculum and various characteristics. Therefore, some students found themselves immersed in their study and, in many instances, may sacrifice their social life, sleep, and exercise. All these factors can play a significant role in creating a greater workload and stress, from which most students experience difficulties in their study. Numerous research studies have indicated that better time management is associated with improved learning outcomes; these studies also showed that students learn to cope with competing demands by developing coping skills [18–22]

Another factor that has been assessed in the current study, related to the education process in the BDS 1st year study, is the students' perception about the competence of their teachers. The vast majority of students of the examined groups showed high satisfaction and conviction that the 1st year teachers were capable of delivering clear and understandable didactic lectures and also informative laboratory sessions. Hence, the question may arise as to what factors are most likely to cause the perceived difficulties. Meanwhile, when factors related to the teachers were excluded, based on the examined groups' perceptions, then other difficulty factors may be significantly more relevant. Moreover, it should be noted that some instructors, in reality, provide lectures in mixed languages methodology, for example, lectures are given in Arabic and English. In doing so, students will find lectures easy to understand. However, home studying from English textbooks might be a difficult task. Students in such instances are constrained to use dictionaries for translating materials that are not understood, which is another burden on students and is considered time consuming and, in many cases, viewed as ineffective. This is consistent with the perception of students in different past research investigations, where students found it convenient in attending lectures that are given in Arabic and English [17, 23, 24].

The following limitations of the current study could have resulted in bias: (1) no female students were enrolled in this study and (2) no students from other dental colleges were enrolled in this study. Despite the similarities in the circumstances that students may confront throughout their 1st year study, it is expected that some variances in intellectual capabilities, ideas, and opinions will exist. Limiting the survey to a sample

of students from a single dental school may not accurately reflect a broader perception of BDS 1st year students, despite some parallels. Additional research including male and female students from various schools may shed more light on this subject.

CONCLUSION

With the majority of students agreeing on the relevance of the difficulty factors discussed in this study, some factors were found to be more influential and have caused more difficulties than others in the BDS 1st year study. Most students felt quantity of courses studied paired with vast amount of materials to be remembered and memorized along with learning in the English language as the most influential. The challenges encountered by students throughout their BDS 1st year study were not necessarily caused by a single subject, such as the two dental materials courses, but rather by a collection of overlapping factors that had a cumulative effect on the entire BDS 1st year study.

Acknowledgments

I wish to gratefully acknowledge the faculty of dentistry, Najran University, KSA. I'm also grateful to the following people for their support and continuous assistance: Prof. Sohail Zafar, Dr. Naser Al-Arfaj, Dr. Abdu Abdulrazzag, Mr. Hussein Hushaish, and Mr. Adel Albakry. I would like to express my gratitude to Professor Michael Swain for the constructive comments on the manuscripts.

Funding

The author declares no specific funding or other financial support for the present investigation.

Author Contribution

The author confirms sole responsibility for study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Conflict of Interest

The author declares that the work documented in this scientific article is not recognized for any conflicting financial interests and/or personal connections.

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