



Early Clinical Exposure and Near Peer Learning: Leading-edge Effective Teaching-Learning Module in Dentistry

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Received: 06-November-2023, Manuscript No. ijmrhs-23-119290; **Editor assigned:** 09-November-2023, PreQC No. ijmrhs-23-119290 (PQ); **Reviewed:** 14-November-2023, QC No. ijmrhs-23-119290 (Q); **Revised:** 07-December-2023, Manuscript No. ijmrhs-23-119290 (R); **Published:** 10-December-2023, **J-invoice:** J-119290

ABSTRACT

Background: Students studying dentistry typically have minimal opportunities to develop their teaching abilities. There is no literature in dentistry education that describes the merger of 'Early Clinical Exposure' (ECE) and 'Near Peer Learning' (NPL) Module with regard to first-year BDS students and interns. Author created a novel module for ECE and NPL to evaluate its impact in knowledge. **Materials and methods:** 2016 to 2022 six batches students and interns participated in this module including 535 First BDS students and 60 interns. This study was conducted in two phases: Initial Preparation by Faculty to teach theory and demonstrations to First BDS students and Training Sessions for interns and in second phase the actual implementation of ECE-NPL Module. The first year BDS students were first time introduced in clinics and Alginate impression clinical procedure was demonstrated on patients by interns. The Global Rating Scale was used to validate and rate the pre-test and post-test checklist. Paired t-tests were used for the pre- and post-test analyses to evaluate the module's outcomes. **Results:** Paired t-tests analysis of Pre and post-tests to evaluate outcome of the module shows that outcome factors are increased by the demonstration in clinics. The chi-square goodness of fit test for impact of ECE on students was $\chi^2(3)=315.654$, p value <0.05 and for Intern's perception about NPL was $\chi^2(2)=37.900$, p value <0.05 and First Year Student's perception about NPL was $\chi^2(4)=586.393$. **Conclusion:** This study shed light on the clinical training approach used in a dental undergraduate program and emphasized the advantages of ECE and NPL in the study population. It works well as a supplement to conventional teaching techniques. The positive feedback from the students was received and scored high rating.

Keywords: Early Clinical Exposure, Near Peer Learning, Effective Teaching Learning-Module, Innovative, Education, Dental

INTRODUCTION

Education is a beacon that points humanity in the proper way as it develops. Innovation is the process of combining information, aptitude, and attitude into fresh, novel, and logical ideas. The way a teacher uses instructional tactics when giving lectures or instructing in clinics determines how innovative a lesson will be. Innovative applications ought to be supported by evidence [1]. Today, training undergraduate students in numerous areas updated standard abilities is becoming more and more important [2]. Teaching innovation

strives to develop students' creative thinking and foster their skills by implementing the heuristic style of teaching. Innovative education is different from the traditional education. It is a process which helps the students to cultivate interest in learning and inculcate newer expertise such as: 'Self-directed learning', 'Problem-solving', 'Critical thinking' and 'Decision making' [3,4].

Teaching is a valuable skill. One of the best methods to achieve expertise and developing mastery is via teaching peers. By including students in some aspect of the learning process, teachers can ensure that their students have a complete comprehension of the material, with opportunities to demonstrate as a chance to "learn twice" [5]. Students who can appropriately and accurately teach others about a subject will have a very good grasp of the material as well as greater memory and recall.

Edgar Dale, a renowned educationist, created 'learning pyramid,' also known as the 'cone of learning,' which was later updated by the National Training Laboratory Institute. The Learning Pyramid model contends that different study techniques will result in greater understanding and longer-term memory retention. It also contends that some study techniques are more effective than others. According to the Learning Pyramid model, students typically only retain approximately 10% of what they study in textbooks but nearly 90% of what they learn from mentoring others. Peer tutoring is the most often used method of education [6].

'Near-Peer Teaching' (NPT), where a learner instructs peers [7]. Numerous healthcare institutes have adopted NPT as a way to supplement the limited teaching resources provided by faculty members and/or to help healthcare students improve their teaching abilities and get ready for a lifetime of instructing [8]. NPT has been defined by many authors in a variety of ways. A type of instruction called "Near Peer Teaching" is an educational approach that has been proven to be successful [9]. In NPT, students with similar backgrounds who are one to two years apart teach each other in this teaching exchange program [10]. 'The practice of students teaching other students in a setting directed & planned by teachers' [11].

Near-peer learning is a rapidly growing topic of educational research in several fields. One of the various educational tools that can help students study in many higher education institutions is Peer-Assisted Learning (PAL). According to the definition of PAL, "it is people from similar social groups who are not professional teachers helping each other to learn and learning themselves by teaching" [12]. Peer learning is also known as 'Near Peer Learning,' and 'Team Learning.' These terms are all interchangeable [13].

A change from 'pedagogy' to 'andragogy' is required for 'Early Clinical Education/Exposure' (ECE). Preclinical or basic sciences and clinical sciences are separated by ECE. Instilling a sense of accountability and fostering independent learning in the children is accomplished by doing this. Its implementation is possible in three different ways. The first type of patient exposure is in a college or classroom context, the second type involves taking students to hospital 'wards/clinics,' and the third type involves 'community or underserved opportunity programs.' Basically, ECE is defined as, "a teaching and learning methodology that fosters exposure of medical students to patients (actual human contact) as early as the first year of medical college, in a social or clinical context that enhances learning of health, illness or disease, and the role of the health professional" [14]. This suggested that, it is actually a teaching and learning system that promotes dental students' exposure to patients with real human interaction in the beginning of first year of dental school, in a social or clinical environment that facilitates learning in healthcare field. Students must also comprehend the philosophical presuppositions and theoretical viewpoints that define a particular instructional framework, without succumbing to the idea that teachers should be more concerned with the practical issues and problems that arise in the classroom on a daily basis than with the theoretical issues that are supposed to be of concern only to academics or theorists. If brand-new, cutting-edge reform initiatives are to be successfully implemented in real classroom environment, this artificial divide between the theoretical and practical worlds in teachers' minds needs to be crossed [15].

Students studying dentistry typically have minimal opportunities to develop their teaching abilities. There is no literature in dentistry education that describes the merger of NPL and ECE with regard to first-year BDS students and interns. We created a novel module for 'Near-Peer Learning' and 'Early Clinical Exposure' for

active and effective 'Teaching-Learning' in Dentistry to address this demand which is Outcome led structured programmes for Dental students.

Under the supervision of instructors, interns taught First BDS students. It is a useful supplement to conventional teaching techniques and considered as 'student-centred learning', 'participative learning' or 'experiential learning'.

The study was conducted with following objectives:

- To create and implement a module for near-peer learning for dental students.
- To create and implement a module for early clinical exposure for dental students.
- To assess how both these modules affect first-year BDS students' knowledge of dentistry.

MATERIALS AND METHODS

The Institutional Ethical Committee Approval No. VSPM's /DCRC/Dean/IEC/Staff/37 dated 8th September 2015 was obtained from one of the top Dental Institute in Central India, VSPM's Dental College and Research Centre, Nagpur which is affiliated to Maharashtra University of Health Sciences, Nashik. Before beginning the module, signed informed consent was obtained from the participants after they had been made aware of the study's goal and design. The confidentiality of any information shared throughout this training was assured.

Participants

The participants were first BDS students and Interns posted in Department of Prosthodontics or any intern who is willingly participate in study posted in other department was allowed to perform the role of Near peer tutor. First BDS Students (n=535) and interns (n=60) were involved in this study. The study was conducted between 2016 to 2019 and 2021-2022. This study was not conducted in 2020 due to unprecedented COVID-19 pandemic situation.

Study Design

Figure 1 presents Initial Preparation by Faculty to teach theory and demonstrations to First BDS students during lecture and Training Sessions for interns. First-year BDS students were made aware of the 'Early Clinical Exposure' (ECE) and 'Near Peer Learning' (NPL) modules during the dental material theory lecture. The faculty delivered a didactic session to discuss the properties and handling of alginate using a power point presentation, and patient videos demonstrating alginate impressions were also shown and explained. The students were shown a live demonstration of manipulating alginate during class, along with an impression of a model with partial dentition. To assess the students' knowledge following a didactic lecture, a pre-test was given.

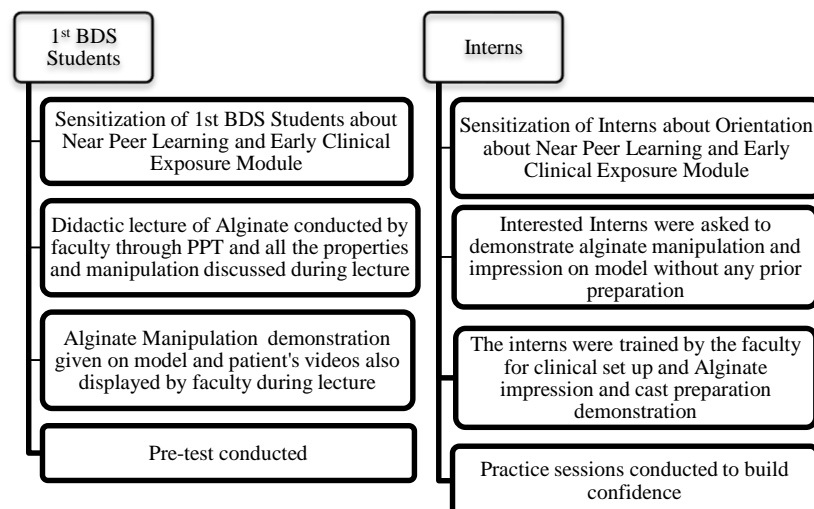


Figure 1 Initial Preparation by Faculty to teach theory and demonstrations to First BDS students during lecture and Training Sessions for Interns

Figure 2 presents the actual implementation of 'Near Peer Learning' and 'Early Clinical Exposure' Module.

First BDS students were divided into smaller groups. 100 First-year BDS students were separated into 10 groups of 10 students each. First BDS students were exposed to a clinical setting for the first time. One intern led one group. The first year BDS students were first time introduced to using a dental chair and clinical equipment. Alginate impression making demonstrations were planned, and interns performed the process on patients in small groups while simultaneously demonstrating impression pouring and cast preparation. To evaluate the effectiveness of this module, a post-test was administered. The Global Rating Scale was used to validate and rate the pre- and post-test checklist. A feedback form was used to get students' opinions on the early clinical exposure. Interns and first-year BDS students collected validated feedback on a five-point Likert scale (Strongly Disagree-1 to Strongly Agree-5) regarding their near-peer learning experience, which included seven statements. Faculty members took note of the interns' and students' reflections on this module after it was completed.

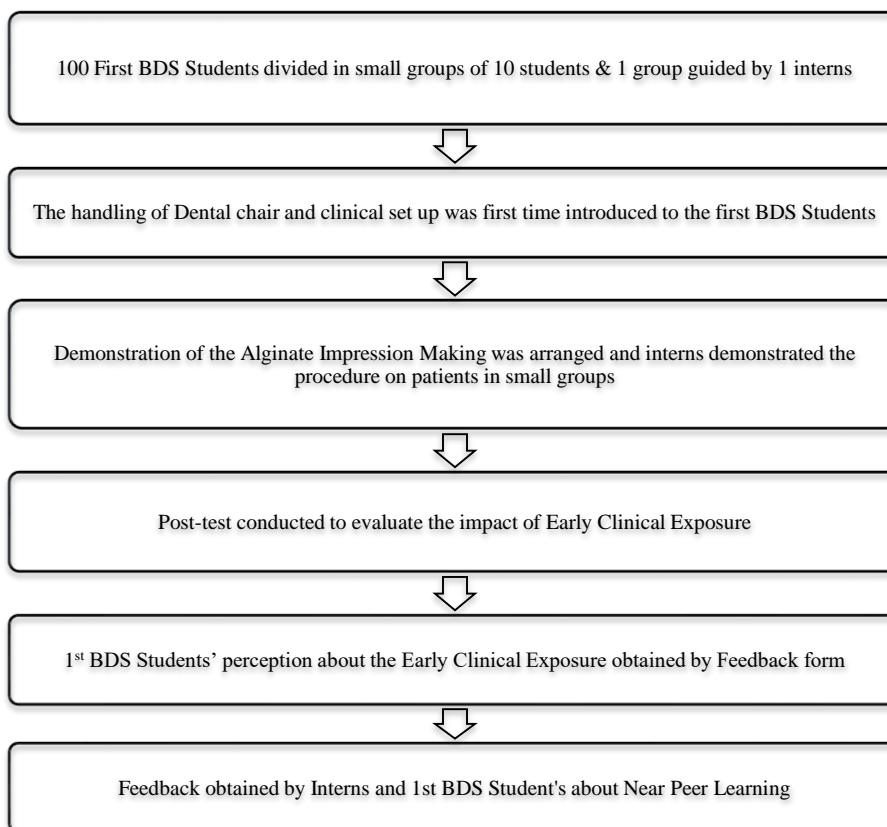


Figure 2 Implementation of 'Near Peer Learning' and 'Early Clinical Exposure' Module

Data Analysis

Paired t-tests were used for the pre- and post-test analyses to evaluate the module's outcomes using R software version 4.1.2. First BDS Using IBM Statistical Package for the Social Sciences (SPSS) Version 20, student feedback analysis for Early clinical exposure, First BDS students, and Interns feedback analysis of Near Peer Learning was completed. To determine whether a categorical variable's frequency distribution deviates from predictions, the Chi-Square goodness of fit test was used. Only feedback forms that were submitted and returned were examined.

RESULTS

Subject Demographic

Table 1 shows 2016 to 2022 six batches students and interns participated in this module. Total 60 interns i.e. 10 interns per year and 535 First BDS students participated in this study. 82, 89, 91, 92, 94, and 87 First BDS students, respectively, participated in this study from 2016 to 2022, with the exception of the unprecedented Covid-19 pandemic year 2020.

Table 1 Demographic details and characteristics of participants

Year	Students	Interns
2016	82	10
2017	89	10
2018	91	10
2019	92	10
2021	94	10
2022	87	10
Total	535	60

Pre-Test and Post-Test Analysis to Evaluate Outcome of the Module

Table 2 displays the results of Paired T-tests for the variables that were examined through Pre-test and Post-test for Operators Preparation, Infection Control Protocol, Patient Preparation, Patient Adjustment in the Dental Chair, Operators Position During Maxillary and Mandibular Alginate Impression Making, Perforated Tray Selection in Patient's Oral Cavity, Properties of Alginate, Alginate Water: Powder Ratio, Alginate Manipulation Procedure, Impression making and evaluation, Impression pouring and Cast preparation.

Table 2 Pre-test and post-test analysis to evaluate Outcome of the Early Clinical Exposure

Variables under study	t	p-value	Conclusion about H ₀
Operators Preparation	-51.098	< 2.2e-16 =.000	Reject
Infection control protocol	-55.146	0	Reject
Preparation of the patient	-53.219	0	Reject
Adjustment of the patient in the dental chair	-51.686	0	Reject
Operators position	-54.169	0	Reject
Perforated tray selection in patient's oral cavity	-52.248	0	Reject
Properties of alginate	-48.973	0	Reject
Alginate Water: powder ratio	-47.982	0	Reject
Alginate Manipulation procedure	-52.513	0	Reject
Impression making and evaluation	-52.555	0	Reject
Impression pouring	-50.392	0	Reject
Cast preparation	-52.522	0	Reject

A paired t-test demonstrates that H₀: There is no statistically significant difference between the pre- and post-demonstration ratings on any of the aforementioned categories. In contrast to H₁: Pre demonstration scores are lower than post demonstration scores for all variables, indicating that demonstration in clinics increases knowledge and understanding of the topic, the former statement holds true with Significant level=5% =0.05.

Test criteria: Reject null hypothesis H_0 , if $p\text{-value} < \alpha$; Accept null hypothesis H_0 , if $p\text{-value} \geq \alpha$. Here, $p\text{-value} < \alpha$. Hence, we Reject the null hypothesis H_0 . Therefore, we draw the conclusion that all twelve of the aforementioned factors are increased by the demonstration in clinics during early clinical exposure.

Impact of Early Clinical Exposure Feedback

Table 3 displays the findings from the chi-square goodness of fit test for Early Clinical exposure. As seen in the table our test statistic $\chi^2_{(3)} = 315.654$, $p\text{-value} < 0.05$. We therefore reject the null hypothesis and come to the conclusion that there are statistically significant differences between the students' preferences regarding the degree of agreement with the given statements about ECE, with fewer students ($N=11$) favoring option 2, and more ($N=54$) favoring option 3, as compared to either option 4 ($N=223$) or option 5 ($N=247$).

Table 3 Impact of Early Clinical Exposure Feedback

Statements	Chi-Square	Degree of freedom	p-value
2. Conventional teaching methods of didactic lectures do not provide understanding of the topic	315.654	3	0
3 i. Finding my way through the ECE module was easy	400.69	1	0
3 ii. I felt that programme enhanced my knowledge about impression making with alginate	527.03	1	0
3 iii. I feel that the programme will increase my confidence in treating same type of patients	523.067	1	0
3 iv. I feel that ECE will improve my understanding in theory	411.142	1	0
4. This module should be used along with the Conventional teaching methods regularly	219.693	2	0

ECE had a very beneficial impact on educational outcome domains. In response to the question 'Do you think that early clinical exposure in First year BDS is useful?' the first BDS was asked three open-ended questions. When asked, 'And Why?' 100% of the students responded that having early clinical exposure in the first year of BDS is beneficial because it helps them connect the theory to clinical application through direct contact with clinics. Some students believed that the understanding of the subject matter was unquestionably very low and unstable, and that clinical application of any dental material required considerable study time.

If students participate actively in their education, they can make the subject of dental materials exciting. Students responded to the question, "What was the best thing about the module?" with responses like how their first experience working in clinics helps them understand their future role as dental professionals and how learning the same theoretical material clinically increases retention and makes the otherwise dry subject more interesting. The ECE module was rated as Informative, Enjoyable, Innovative, and Useful by nearly all students. To make this module more user-friendly for students, ideas from students were encouraged. They were questioned regarding this by the first BDS: 'Do you want to suggest any changes in the module to make it better?' The module was well received by the students, who recommended that this ECE exercise be conducted in the future for other dental materials-related topics.

Student's perception about Near Peer Learning

Table 4 presents the results of the chi-square goodness of fit test for Student's perception about Near Peer Learning. We can see from the table our test statistic $\chi^2_{(4)} = 586.393$, $p\text{-value} < 0.05$. We therefore reject the null hypothesis and come to the conclusion that there are statistically significant differences in the preferences of the students regarding the degree of agreement with the stated statement, with fewer students ($N=4$) favoring option 1, and more ($N=22$) favouring option 2, as compared to either option 4 ($N=258$) or option 5 ($N=229$).

Table 4 Student's perception about Near Peer Learning

Statement	Mean	Std. Deviation	Chi-Square	df	p-value
Near peer learning has boosted my confidence to study	4.28	0.789	586.393	4	0
Near peer learning has Improved my skills	4.3	0.721	371.774	3	0
Near peer learning is Motivating	4.33	0.662	404.731	3	0
I believe near-peers can serve as effective teachers	4.29	0.83	540.897	4	0
This program help me in self-learning habit	4.36	0.702	614.056	4	0
Near-peers who taught me performed well in their teacher roles	4.42	0.704	663.589	4	0
Can continue Near peer learning program	4.35	0.811	539.72	4	0

Intern's Perception About Near Peer Learning

Table 5 presents the results of the chi-square goodness of fit test for Intern's perception about Near Peer Learning. We can see from the table our test statistic $\chi^2_{(2)} = 37.900$, p value < 0.05. Therefore, we reject the null hypothesis and conclude that there are statistically significant differences in the preference about level of agreement of the interns for the given statement with less people (N=5) preferring option 3 compared to either the option 4 (N=13) or the option 5 (N=42).

Table 5 Intern's perception about Near Peer Learning

Statement	Mean	Std. Deviation	Chi-Square	df	p-value
I felt comfortable in my role as a teacher.	4.62	0.64	37.9	2	0
I believe that students benefited from my teaching	4.6	0.616	33.6	2	0
I learned a lot about techniques of teaching	4.7	0.591	51.6	2	0
I learned a lot about the subject matter while teaching	4.75	0.571	63.3	2	0
If I had the same choice, I'd choose to be a NPT again	4.65	0.577	39.9	2	0
Every dental student should learn how to teach	4.62	0.585	34.9	2	0
Can continue Near peer learning program	4.7	0.561	48.9	2	0

DISCUSSION

The near peer program was implemented successfully. From the viewpoints of both peer teachers and learners, it reaffirmed the advantages of peer teaching. In terms of improved learning outcomes, students said that peer teaching helped them improve their communication skills, self-reflection, sense of teamwork, supportive relationships, psychological well-being, social competence, self-esteem, increased accomplishment, and productivity. My confidence to study the subject has increased because to near peer learning, which has also allowed me to enhance my skills. Near-peers are good teachers and encourage self-learning. Near-peers who taught did well in their positions as teachers.

Students profited from their instruction, the interns felt at ease in their job as teachers, they learnt a lot about teaching approaches, they experienced deep learning about the subject, and they would prefer to be near peer tutors again. Dental students should all learn how to educate, according to interns. Both the interns and the students were open to continuing this module in the future.

Early clinical exposure enables first-year BDS students to correlate the theoretical concepts in the clinical setting, in contrast to conventional teaching methods of didactic lectures, which they thought did not provide knowledge of the subject. They found this program to be highly engaging, and it improved their understanding of alginate impression-making techniques. They felt more confident about treating the same patients in clinics in the future after taking the module.

A 2011 systematic review by Yu TC *et al.* further demonstrated the value of PAL in medical education. PAL has been found to have positive effects on a number of fronts, including raising student's levels of clinical practice confidence and enhancing educational outcomes both Secomb J and Schaffer JL *et al.* found evidence in the literature that it has a favourable effect on the areas of educational outcome [16-18].

Our study's findings are consistent with those on medical students for near peer teaching conducted by Jackson in 2012 [19]. An adequate context for developing, assimilating, and applying knowledge acquired in academic contexts is provided by the early patient engagement and actual clinical circumstances [20,21].

Clinical experience aids students in gaining the interpersonal and teamwork skills necessary to work in the multidisciplinary groups that make up the contemporary healthcare situations [22].

Early clinical experience may benefit students' clinical skills development, awareness of their future lifestyle, and exposure to a variety of potential job paths: Students should have the chance to connect the theoretical to the practical during this instructional experience. Additionally, student teachers should have the chance to talk about, reflect on, and share their experiences with instructors and peers. These suggestions are reinforced by research showing that a desire to teach and positive role models have an impact on people's decisions to pursue careers in academic dentistry [23,24]. According to the study conducted by Kawas *et al.* in 2016, PAL/TBL can enhance students' learning opportunities, teaching abilities, social skills development, and teamwork [25].

Peer educators can gain teaching abilities and a greater comprehension of the subject matter through Peer Assisted Learning in addition to generic skills like communication, organization, and presentation [26-28].

CONCLUSION

This study shed light on the clinical training approach used in a dental undergraduate program and emphasized the advantages of early clinical exposure and near peer learning in the study population. In order to guide continued development of the training model, the study functioned as a vehicle for engagement with a variety of stakeholders.

It works well as a supplement to conventional teaching techniques. After early clinical experience, the students' knowledge improved. The interns and students agreed that it enhanced their capacity for critical thought and gave them a deeper understanding of theoretical ideas. The positive feedback from the students was received and scored high ratings. Additionally, it gave dental students the chance to develop their teaching abilities before entering in academic profession.

RECOMMENDATIONS

Dentistry rarely offers undergraduates the chance to teach. Peer teaching has been acknowledged as a valuable and successful learning strategy and has been applied in a wide variety of healthcare courses. The effectiveness of near peer teaching is assumed to be related to the peer tutors' and tutees' capacity for good communication in order to enhance the learning environment. Early clinical exposure aids in bridging the gap between pre-clinical and clinical application. Dentistry rarely uses ECE and NPL as a teaching or learning tool. Therefore, it is important to comprehend this approach and include it into dentistry curricula to make dental education more 'student centric.'

Acknowledgements

The authors would like to thank all the participants (interns and First BDS students) who gave their valuable time and participated in this study.

Disclosure statement

The authors declare that they have no competing interests.

Ethical approval and consent to participate

Ethical approval was granted by the Institutional Ethics Committee of VSPM's DCRC, Nagpur, Maharashtra, India. (Approval No. VSPM's /DCRC/Dean/IEC/Staff/37 dated 8th September 2015)

Funding

The authors reported there is no funding associated with the work featured in this article.

Conflicts of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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