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A MIXED MODEL PILOT STUDY IN INNOVATIVE 'BUDDY SYSTEM' PEER-TEACHING METHODOLOGY FOR POST-GRADUATE COURSE PROGRAMME IN ORTHODONIC EDUCATION

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ABSTRACT

BACKGROUND. Recent advancements in orthodontics demands to shape post graduate students to acquire critical thinking skills and abilities so as to perceive high order intellectual capabilities and excellent clinical competencies. However, a very demanding top-down teaching method might not be beneficial. Hence, there is a need to bridge this research gap by conceptualizing academic curriculum with innovative teaching strategies such as the "Buddy System" aiming at creating a stress-free collaborative learning environment with attainable graduate attributes and competencies.

OBJECTIVE. To evaluate and assess the feasibility and acceptance of innovative 'Buddy System" peer-teaching methodology for postgraduate course programme in orthodontic education.

MATERIALS AND METHODS. A mixed-method pilot study was conducted among thirty postgraduate students (n=30) in two phases. In Phase I, a structured questionnaire comprising 29 items was developed and validated by senior academic faculty, categorized into theoretical, practical, performance-based assessment, and interpersonal skills (Categories I to IV respectively). Phase II employed completion of the questionnaire and semi-structured interviews following a peer-teaching group activity. In the questionnaire attitudes and perceptions were evaluated using a Likert scale. We measured agreement between fellow teachers and fellow learners with kappa statistic, and data were analyzed with IBM SPSS Statistics version 25.0.

RESULTS. The study findings inferred good agreement with a Kappa value of 0.694, 0.683, 0.751 & 0.705 in Category I, Category II, Category III and Category IV, respectively in terms of sharing of study materials in the form of books and research projects. The cumulative Kappa value obtained was 0.996 which indicated excellent agreement between fellow teachers and fellow learners (p value< 0.001).

CONCLUSION. Buddy system could facilitate active learning, collaborative environment and interpersonal support amongst post graduate students, thereby aiding as a desirable integrated peer-teaching model for dental curriculum.

Keywords: *dental education, buddy system, knowledge exchange, peer learning, training*

INTRODUCTION

Orthodontics is a specialty of dentistry that encompasses the management of craniofacial growth and occlusal development, with the use of orthodontic appliance therapy (1,2). Recent advancements/digitalization/globalization in this specific domain, demands postgraduate students to acquire critical thinking skills and clinical proficiencies to precisely interpret, diagnose, analyze and treat patients (3). In the past dental curriculum, "Contemporary traditional teaching methodology" trained postgraduate students to attain diverse proficiencies, including the acquisition of theoretical knowledge, clinical competencies, and interpersonal skills (4). However, it was associated with extreme level of stress/burnout amongst students (perceived stressor) to meet the required quotas (5). Moreover, stress could act as a double-edged sword that can either motivate the students for peak performance or reduce the overall students' performance ability (4,5). Hence, concerted and immediate efforts to transform and scale up teaching-learning methodologies are required to attain the right mix of skills and competencies among students to achieve "stress free environment with attainable graduate attributes" for better learning outcomes (6). Few evidence-based studies have documented that peer teaching can help students manage stress effectively and yield maximum results/benefits by reinforcing latest knowledge, boosting confidence, fostering active collaborative environment with improved communication skills, team work and developing culture of openness in sharing knowledge (7,8). Based on this platform, we conceptualized "Buddy System" peer teaching methodology in our institution. This is first of its kind, that will be implemented in the field of orthodontics subspeciality of dentistry.

"Buddy System" is a kind of peer teaching methodology wherein embodiment of small group of students of same status and/or same discipline, are made to collaborate/work together on the common ground, thereby building a dynamic for learning knowledge and skills in a "collaborative way" in which students teach each other. The uniqueness of this system lied in that fact that students felt safe to make negligible mistakes, ask questions to each other without hesitation, raise concerns & queries, and create a strong social bond to express their emotions such as dealing with uncertainty, dealing with problem solving, empathy and compassion for others, maintaining positive relationships and making responsible decisions (9,10). This style of learning is assumed to increase knowledge retention, improve problem-solving skills, and strengthen student's intrinsic motivation (9). Given the current decline in students attending didactic teaching sessions, with more information being available online, the buddy system could aid in bridging the knowledge gap in a more integrated, relieving the transition between

didactic teaching and clinical skills. The greatest challenge perhaps is to draft a questionnaire that is psychometrically sound, efficient and effective for use in clinical settings. Therefore, the aim of the current study is to evaluate and assess the innovative 'Buddy System' peer-teaching methodology for post-graduate course programme in orthodontic education.

MATERIAL AND METHODS

Description of new innovative "Buddy System". The "Buddy System" is a type of peer teaching approach in which a small group of students with similar statuses and/or disciplines must cooperate and work together on common ground. This creates a dynamic for students to learn knowledge and skills in a "collaborative way" by teaching one another. This system was unique in that students felt free to make small mistakes, ask questions of one another without hesitation, voice concerns and questions, and form a strong social bond to express their emotions, including managing uncertainty, solving problems, empathy and compassion for others, upholding positive relationships, and making responsible decisions.

Study setting. This was a mixed model study design conducted at KLE VK Institute of Dental Sciences (over three months from February 2024 to April 2024).

Buddy system intervention. Buddy system is a peer teaching group activity. A multi-participant type, cross-age peer tutoring method was applied. A small group activity was conducted involving the study participants where one senior PG resident was made the head of the group, designated as "Group Leader/ Fellow Teacher" who was responsible to monitor and teach clinical/research and academic activities on day-to-day practices. The others were designated as "Fellow Learners" who were junior PG residents who were responsible to Fellow Teacher with their academic/clinical and practical activities including literature search, assisting in preclinical lab and library related activities such as books/articles/monographs, patient centric activities and pedagogical activities. The activity was conducted and monitored by senior professors for specific duration of 3 months (Figure 1).

Conceptual framework & methodological approach. The study was conducted in two phases as depicted in Figure 2. Phase 1 involved formulating a structured, validated questionnaire (open ended questions) by senior academic committee members/Professors/Guides. A total of twenty-nine questions (n=29) were identified and divided into four categories (Category 1: Theoretical skills; Category II: Practical skills; Category III: Performance based assessment skills & Category IV: Interpersonal skills). This was called as "Interview Guide".

Phase 2 involved semi-structured interview method with all the participants designated as “Group Leader/Fellow Teacher” and “Fellow Learners”, after exposure to “peer-teaching group activity”. Stress level and overall attitude/perception of “Group Leader and Fellow Learners” towards this system was assessed using Likert’s scale to measure the subjective data. A single item scale for immediate assessment was applied asking the question “How stressed are you feeling?” (1= not at all to 5 – extremely stressful). The typical time taken to complete the consent and questionnaire was approximately 5-10 minutes. Since this is a mixed model study with semi structured interview and questionnaire, blinding is not applicable as this is not an intervention study. However, we applied blinding for “peer teaching group activity”. This study employed a single-blind design. Although participants were aware of their involvement in the peer-teaching activity, the external interviewer conducting the semi-structured interviews was blinded to the participants’ roles (Fellow Teacher or Fellow Learner). Additionally, all questionnaires were anonymized to ensure blinded data analysis.

Questionnaire development. A semi structured interview guide with questionnaire that integrated both qualitative and quantitative data collection methods was developed. In accordance with the "Guidelines proposed for mixed model approach by Venkatesh et al. (2013)," the study addressed the following topics: paradigmatic assumptions (pragmatism, transformative-emancipatory, and critical realism), time orientation (concurrent and sequential), inference quality (design quality and explanation quality), and the goals of mixed methods research (complementarity, completeness, developmental, expansion, corroboration/confirmation, compensation, and diversity) (11). Recall bias was mitigated as we formulated all open-ended questions without including close ended or dichotomous questions. Content Validity was conducted through expert panel review (one senior professors & four guides) using Content Validity Index (CVI). Items with I-CVI ≥ 0.78 were retained, ensuring relevance and representativeness of all questions. Experts and pilot participants assessed clarity, readability, and appropriateness, resulting in qualitative feedback that refined item wording and structure. The development of the questionnaire included reference to established frameworks in dental education and collaborative learning. The initial draft underwent cognitive interviews and pre-testing with a subset of target participants to confirm interpretability, relevance, and clarity, in accordance with best practices for scale development. Questionnaire items were mapped against published frameworks for peer-assisted and collaborative learning in dental postgraduate education to ensure theoretical alignment.

Study participants and eligibility. Postgraduate students of the Department of Orthodontics between the academic year 2016 to 2023 from the institute were included in the study. The exclusion criteria were postgraduate students who were not willing to participate and/or students enrolled in BDS programme or any other interdisciplinary programmes.

Sampling. This was a pilot study; we estimated the sample size using the 95% CI for a 1-sample proportion p±1.96. To successfully assess this feasibility retention goal, a pilot study sample size of 26 participants was required to achieve a 95% CI of (0.85, 0.95) for a 1-sample proportion.

Ethical consideration and informed consent. Ethical approval was obtained from the Institutional Research and Ethics Committee with Ref no:1383/079. This study complied with the Helsinki Declaration of 1975, revised in 2000 and the ethical guidelines for human experimentation. Participants received detailed information about the study and provided informed consent prior to participation, emphasizing voluntary involvement and the right to withdraw at any time. During questionnaire administration, no personally identifiable information was collected.

Data collection. After 3 months duration of peer-group teaching activity, all the participants were subjected to the semi structured questionnaire that involved one senior staff member from other health science discipline was invited as “interviewer” who initiated the interview by establishing good rapport with the participants. The interview was conducted individually with all the participants. The interviewer was provided with the interview guide (questionnaires) that included key questions and a mix of predetermined and flexible probes. The interviewer actively listened and asked follow up questions to enhance in depth more detailed answers, gathering insights into each participants behaviour and opinions. A more conversational flow with comfortable environment was provided for the participants to express themselves. Likert’s scale was used to assess the perception of students towards this system. The obtained data was enveloped and sealed thereafter and sent to the first author as confidential document.

Each questionnaire was coded with anonymized identifiers, and completed forms were sealed in envelopes to prevent any linkage to individual identities. For interviews, confidentiality was maintained through secure handling of transcripts and anonymization of responses. Interviews were conducted privately, and only the research team had access to de-identified data. All data were stored securely in password-protected files accessible only to authorized personnel, complying with institutional and legal data protection standards. We had

specified code numbers for each questionnaire in printed forms and had distributed to all participants, thereby maintain their anonymity and confidentiality.

Data processing and analysis. The recorded data were input into Microsoft Excel (2019) and analyzed using IBM Corp. 2017, IBM SPSS® Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp. Descriptive analysis was employed and the statistical significance was set at $P \leq 0.05$.

RESULTS

A total of 30 postgraduate students participated during the piloting of this study. 80% (n= 24) were women and 20% (n=6) were men. The age group ranged between 25 years to 38 years. In category I (Theoretical skill assessment), there was overall good agreement with a Kappa value of 0.694. However, out of all questions, (I 5A) showed no agreement at all with the Kappa value of -0.034 (Table 1). In category II (Practical skill assessment), there was overall good agreement with a Kappa value of 0.683. However, question (II 6C) showed excellent agreement with the Kappa value of 1.000 whereas questions two and three showed fair agreement with the Kappa value of 0.507 and 0.598 respectively (Table 2). In category III (Performance based assessment skill), there was overall good agreement with a Kappa value of 0.751. Amongst all, question four shows no agreement with the Kappa value of -0.078 (Table 3). In Category IV (Interpersonal skill assessment), there was overall good agreement with a Kappa value of 0.705. Amongst all, question four shows fair agreement with a kappa value of 0.448 whereas questions (IV 5A) and (IV 5C) show excellent agreement with a Kappa value of 1.000 respectively. Also, question (IV 5B) shows good agreement with the Kappa value of 0.651 (Table 4). Also, the overall Kappa value obtained was 0.996 which shows that there was excellent agreement (Table 5). The Likert's scale was applied as strongly disagree (1 point scale) to strongly agree (5-point scale). Percentages shown in Tables 1-4 represent the proportion of responses within each role group (Fellow Teachers and Fellow Learners), enabling comparison of perception trends between the two roles in the Buddy System. This role-wise distribution reflects how each group experienced the learning process and contributed to interpreting the level of agreement across domains. The Buddy Learning System demonstrated the highest success among both fellow teachers and fellow learners in domains where the majority of participants agreed or strongly agreed. These included sharing of research work and academic materials, exposure to clinical case scenarios, collaborative formulation of examination strategies, and academic and patient-care decision-making, reflected by good to excellent agreement across Categories I, II, III, and IV.

In contrast, the system was less successful in areas such as exchange of literature search strategies, preparation and arrangement of patient data for examinations, and certain aspects of routine clinical management, where fewer participants agreed or strongly agreed and low to fair agreement was observed between Fellow Teachers and Fellow Learners.

Internal consistency. Cronbach's alpha was used to test the internal consistency for the 30 post-graduate students as well as alumni who completed the questionnaire. The overall inter-item value was 0.959 and the corrected item-total correlation of 0.921 was achieved, producing a good level of internal consistency. The overall Cronbach's alpha value obtained was 0.999, which was indicative of good internal consistency. As the *p* value was < 0.001, it is indicative of statistically significant result. The overall correlation coefficient was 0.998.2

DISCUSSION

"Buddy System" is a peer teaching educational module whereby there is acquisition of knowledge and skills through active helping and supporting among status equals or matched companions (13). It is seemingly bidirectional, creating an open, informal, cooperative environment, in which students can learn from each other in a collaborative way either in pairs, or in multi-participant groups as depicted in our study (14,15). Hence, the current study aimed at appraising the effectiveness of the buddy system and its applicability in orthodontics education which would serve as a "one-of-a-kind tool".

In the current study, the principle of Vygotsky's theory was applied wherein one of the students is typically referred to as the fellow teacher who, under the guidance of an experienced teacher, instructs the remaining members of his/her class (16). Peer tutoring is basically of five types, namely same age peer tutoring, cross age peer tutoring, class wide peer tutoring, incidental peer tutoring and structured peer tutoring. In the present study, cross age peer tutoring method was deployed wherein the tutor is older than tutee (17).

The present study was in good agreement in understanding the subject concepts and exchange of study material in terms of research work and books however the same was not appreciated in terms of literature search. These findings were in congruence with observations by Hunt et al. (18) and Freret et al. (19) wherein peer-assisted learning methods led to reciprocal learning, allowing tutors to gain a deeper understanding of topics previously learnt, providing a good recap of information, helping identify their learning styles, as well as streamline the knowledge they had acquired throughout the course. Herrmann-Werner et al. (20) supported the fact that student teachers are able to retain more knowledge than those only visiting the teaching sessions since to teach is to learn twice. The exchange of subject concepts among the buddies

seems to pull different strings of knowledge acquisition and retention. Teaching seems to foster an internal drive to study material more meticulously than when merely attending the very same class. Moreover, the student was fully immersed in learning process with full involvement, thereby proving the flow theory as proposed by Csikszentmihaily (1990) rightful. (21).

The clinical teaching qualities of significance include rapport (i.e., availability, approachability, and student-patient relationships), role modelling, and feedback all of which could form the very backbone of the applicability of the buddy system to improve routine clinical practice (4). In this regard, the common ground shared between peer tutors and tutees builds a safer, informal yet interactive educational setting and a culture of openness, as noted by Ten Cate and Durning (22).

The buddy system might also facilitate deeper learning processes like brain-storming, mutual problem-solving, and group discussions. Additionally, it fosters students' abstract thinking abilities through the application of contextual learning theory and cognitive development theory. While contextual learning theory asserts that students should engage in learning contexts in order to gain knowledge, cognitive theory emphasizes that students should master fundamental concepts while learning new one (23).

Lack of preparation for arranging the patient during exams (drop out and patient not coming on time) showed no agreement. Tangade et al. (5) while assessing the stress levels among dental school students has stated that factors found to evoke greater stress among dental students of clinical years are fear of failing a course or a year, examination, and grades. So, while it is difficult to eliminate all the stressful problems in a dental education programme, the buddy system positively contributes to co-managing clinical tasks, formulating effective strategies and executing work while also seeding healthy competition and the strive to do better through the implementation of clash of titans in the department which could optimize competitiveness and motivate the students to peak performance (6).

There was little to moderate consensus between fellow teachers and fellow learners on whether the buddy system improved clinical practice and knowledge, but early clinical exposure helped grasp case scenarios. Varghese et al. (7) in her study on peer-assisted learning in a dental environment reported that such methods help build confidence among students and help them with management and conversation skills both of which are equally important in routine clinical practice. In day-to-day clinical practice the problems can be viewed in a multidimensional aspect, the buddy system in such scenarios helps develop an understanding of each other’s strengths and skills to develop a team-based approach which duly enhances their clinical judgement (9). There was an excellent agreement in terms of making thoughtful

decisions regarding patient care advice and the teaching-learning process. By sitting in both seats of the apprenticeship model, dental students were able to reflect on their own experiences and glean meaningful lessons contributing to a well-rounded education. The low agreement observed in domains may be influenced by several cultural, curricular, and institutional factors. The postgraduate curriculum may underemphasize structured training in literature search techniques and evidence-based practice, resulting in variable student competence and less consensus in these areas. Differences in clinical exposure, case load, resource availability, and faculty support across institutions may influence students' experiences and perceptions of routine clinical practice, impacting agreement levels.

The reconsideration of the existing educational system towards a more student-centered orientation such as the buddy system could facilitate collaborative learning and interpersonal support amongst students, which may have a protective effect against difficulties faced whilst in dental institution (24). Possible explanation for non-effective domains of literature search and routine clinical practice could be that postgraduate curricula often under emphasizes structured training in literature search and critical appraisal, leading students to rely on faculty or self-directed learning rather than peers. Furthermore, differences in clinical exposure, caseloads, institutional factors, curricular design and task allocation may limit the consistency of peer support in routine practice. These findings were in discordance with Secmb J et al (25) who inferred positive benefits of peer teaching in clinical outcomes.

Inferences derived from this study were in accordance to study conducted by Yu T C et al (2011) in which there was excellent "cognitive congruence" in which the fellow learners could easily communicate with fellow teachers in their own language and social congruence in which the fellow learners felt more at ease with fellow teachers than with senior clinicians (26). This could be the reason for reduced stress level and improved cognitive and psychomotor skills amongst study participants. Improved communication, empathy, procedural, technical, problem-solving, teaching, clinical, teamwork, leadership, reflection, judgment, and other skills were other major benefits reported in this study. This was in concordance to a scoping review conducted by Feng H et al (2024) who showed similar benefits in PAL programmes (27).

The study has few limitations. Although the current study had a smaller sample size, the data so procured provided promising results for wider implementation of the buddy system within postgraduate teaching in the specialty of orthodontics in dentistry. Whilst this study was limited to only one dental college and therefore within one curriculum, it does show how effective the buddy system is for both student tutors and tutees. Moreover, the data produced

did not appear to be overly biased as the results triangulate well with those found in the literature where the buddy system has been used within other subject areas.

Future scope and recommendations. As this study focused mainly on perceptions of students, future research is planned to incorporate objective measures such as pre- and post-intervention tests, clinical competency evaluations, and case management performance to address this limitation. With more such programs implemented in other institutions across the country, the long-term benefits of this approach will become evident.

CONCLUSION

The participation in structured mentoring activities from an early stage has been shown to positively influence dental education. The Buddy System, as applied in this pilot study, demonstrated potential to enhance active learning, collaboration, and strengthen interpersonal support among postgraduate students. It may serve as a valuable integrated peer-teaching model within the dental curriculum. Future multi-institutional studies with larger cohorts are warranted to evaluate its long-term impact on teaching-learning outcomes across different disciplines of dentistry.

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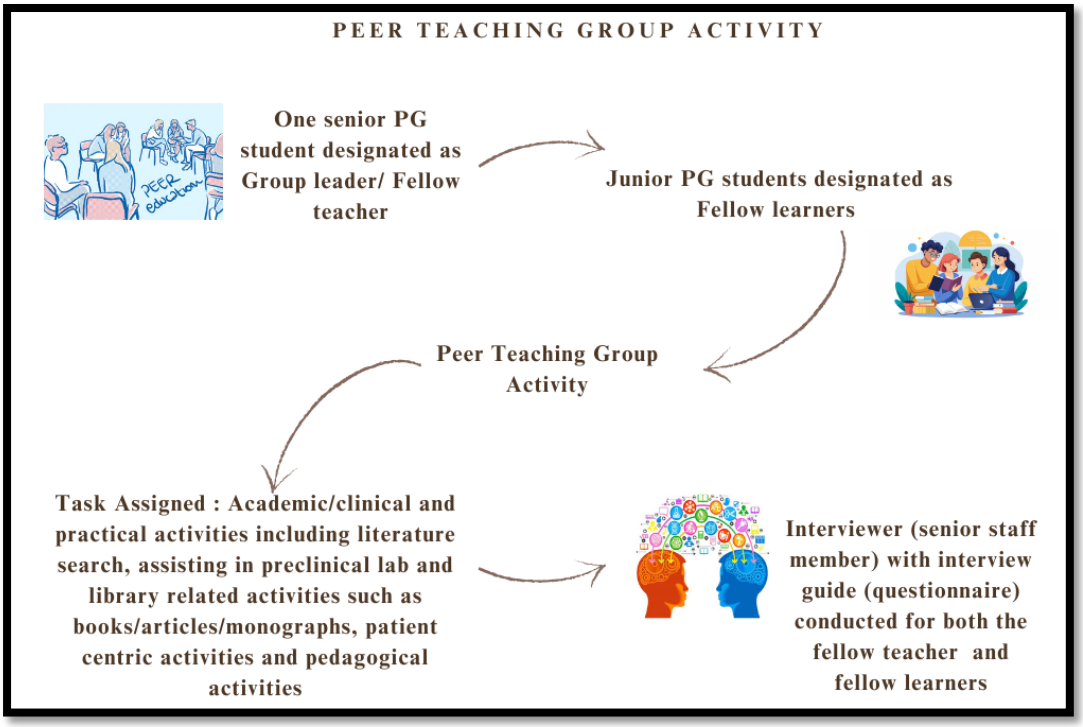

Figure 1. Depicts the conceptual map/graphical representation of "peer teaching group activity" conducted for the study.

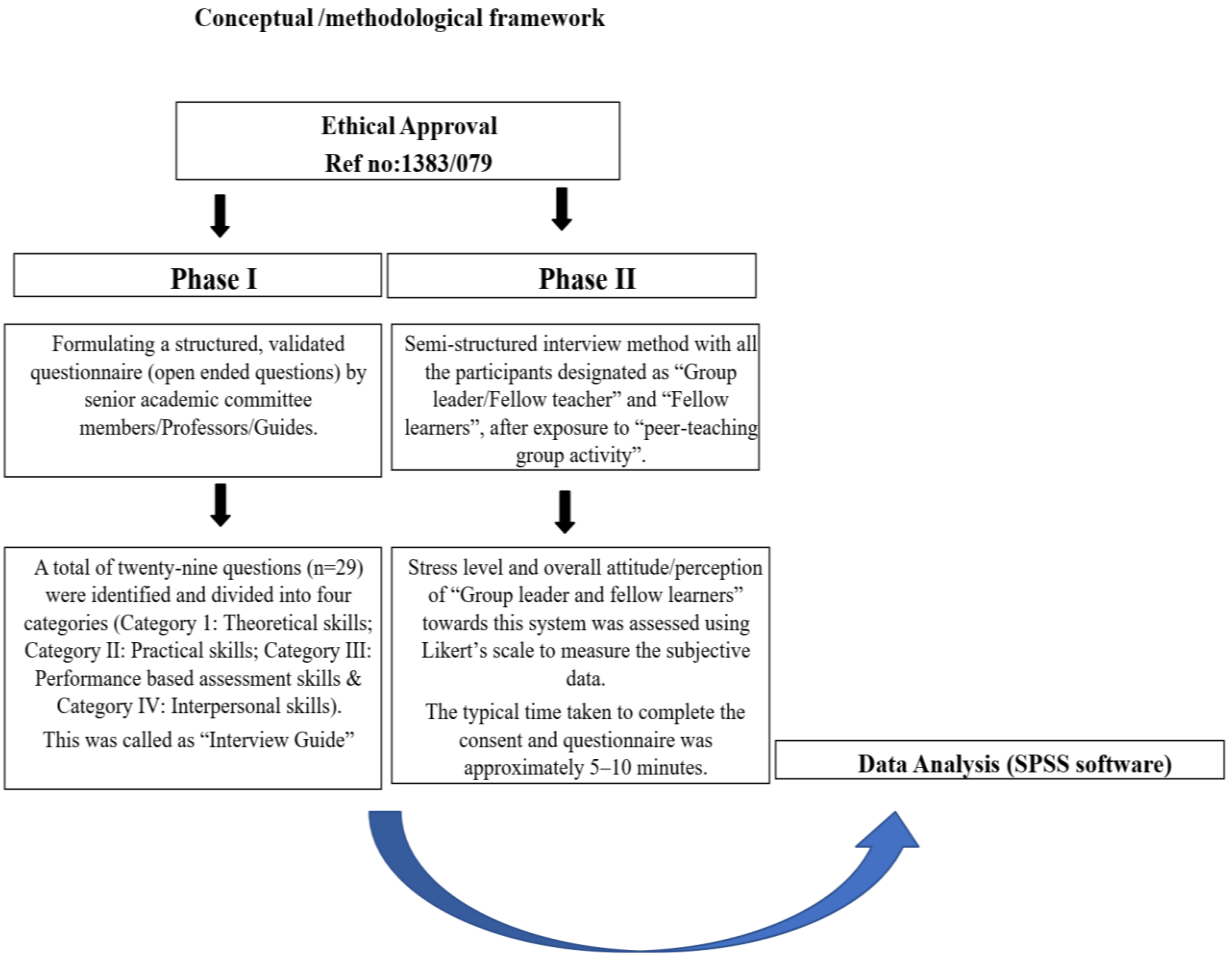

Figure 2. Depicts conceptual/methodological framework of the study

Table 1. Attitudes and perceptions toward theoretical skill acquisition through the Buddy System

Q. No	Key Question	Fellow Teacher					Fellow Learner					Kappa	Result	*p*-value
		Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)			
I(1)	The buddy system helps refine my dissertation work	3 (20%)	5 (33%)	4 (27%)	2 (13%)	1 (7%)	4 (27%)	6 (40%)	2 (13%)	2 (13%)	1 (7%)	0.287	Slight agreement	< 0.05
I(2)	The buddy system helps me understand subject concepts better	5 (33%)	6 (40%)	2 (13%)	1 (7%)	1 (7%)	4 (27%)	7 (47%)	2 (13%)	1 (7%)	1 (7%)	0.535	Fair agreement	< 0.05
I(3)	My theoretical knowledge improves through shared discussions with my buddy	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)	3 (20%)	6 (40%)	3 (20%)	2 (13%)	1 (7%)	0.375	Slight agreement	< 0.05
I(4)	My buddy is approachable for clearing academic doubts	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)	4 (27%)	6 (40%)	2 (13%)	2 (13%)	1 (7%)	0.402	Slight agreement	< 0.05
I(5A)	We exchange literature search strategies and resources	2 (13%)	4 (27%)	3 (20%)	3 (20%)	3 (20%)	2 (13%)	4 (27%)	2 (13%)	4 (27%)	3 (20%)	-0.034	No agreement	< 0.05
I(5B)	We share research-related work and materials	4 (27%)	6 (40%)	3 (20%)	1 (7%)	1 (7%)	5 (33%)	6 (40%)	2 (13%)	1 (7%)	1 (7%)	0.535	Fair agreement	< 0.05
I(5C)	We exchange books and academic reading materials	4 (27%)	6 (40%)	3 (20%)	1 (7%)	1 (7%)	4 (27%)	6 (40%)	3 (20%)	1 (7%)	1 (7%)	0.500	Fair agreement	< 0.05

n (%): Values are expressed as absolute numbers (n) with percentages (%) in parentheses. “Fellow Teacher” refers to senior residents; “Fellow Learner” refers to junior residents. Data shown represent Time 1 responses only. Kappa statistic represents test–retest measuring agreement between Time 1 and Time 2 responses (weighted Kappa used for ordinal data). Percentages were calculated out of the total respondents for each group (n = 15 for Fellow Teachers; n = 15 for Fellow Learners). Interpretation of Kappa: <0 = No agreement; 0.01–0.20 = Slight agreement; 0.21–0.40 = Fair agreement; 0.41–0.60 = Moderate agreement; 0.61–0.80 = Good agreement; 0.81–1.00 = Excellent agreement. *p*-value: A significance level of $p < 0.05$ was considered statistically significant.

Table 2. Attitudes and perceptions toward practical skill acquisition through the Buddy System

Q. No	Key Question	Fellow Teacher					Fellow Learner					Kappa	Result	*p*-value
		Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)			
II (1)	My buddy provides helpful support during clinical procedures	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	0.270	Slight agreement	< 0.05
II(2)	The buddy system enhances my clinical knowledge exchange	4 (27%)	6 (40%)	3 (20%)	1 (7%)	1 (7%)	5 (33%)	6 (40%)	2 (13%)	1 (7%)	1 (7%)	0.507	Fair agreement	< 0.05
II(3)	My buddy helps me in completing laboratory work effectively	5 (33%)	6 (40%)	2 (13%)	1 (7%)	1 (7%)	5 (33%)	6 (40%)	3 (20%)	1 (7%)	0 (0%)	0.598	Fair agreement	< 0.05
II(4)	My ability to manage patients improves through the buddy system	3 (20%)	4 (27%)	3 (20%)	3 (20%)	2 (13%)	3 (20%)	4 (27%)	3 (20%)	3 (20%)	2 (13%)	0.262	Slight agreement	< 0.05
II(5)	My buddy assists me in addressing unexpected clinical outcomes	3 (20%)	4 (27%)	3 (20%)	3 (20%)	2 (13%)	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	0.335	Slight agreement	< 0.05
II(6A)	The buddy system provides early exposure to new techniques	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)	0.348	Slight agreement	< 0.05
II(6B)	The buddy system helps me understand biomechanics/mechanics earlier	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	0.268	Slight agreement	< 0.05
II(6C)	Exposure to case scenarios improves through the buddy system	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	1.000	Excellent agreement	< 0.05

n (%): Values are expressed as absolute numbers (n) with percentages (%) in parentheses. “Fellow Teacher” refers to senior residents; “Fellow Learner” refers to junior residents. Data shown represent Time 1 responses only. Kappa statistic represents test–retest measuring agreement between Time 1 and Time 2 responses (weighted Kappa used for ordinal data). Percentages were calculated out of the total respondents for each group (n = 15 for Fellow Teachers; n = 15 for Fellow Learners). Interpretation of Kappa: <0 = No agreement; 0.01–0.20 = Slight agreement; 0.21–0.40 = Fair agreement; 0.41–0.60 = Moderate agreement; 0.61–0.80 = Good agreement; 0.81–1.00 = Excellent agreement. *p*-value: A significance level of $p < 0.05$ was considered statistically significant.

Table 3. Attitudes and perceptions toward performance-based skill development through the Buddy System

Q. No	Key Question	Fellow Teacher					Fellow Learner					Kappa	Result	*p*-value
		Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)			
III(1)	My buddy provides support during examination preparation	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	0.441	Fair agreement	< 0.05
III(2)	We work effectively as a team during examinations	3 (20%)	6 (40%)	3 (20%)	2 (13%)	1 (7%)	3 (20%)	6 (40%)	3 (20%)	2 (13%)	1 (7%)	0.409	Fair agreement	< 0.05
III(3)	The buddy system helps build a strong academic bond	4 (27%)	6 (40%)	3 (20%)	1 (7%)	1 (7%)	4 (27%)	6 (40%)	3 (20%)	1 (7%)	1 (7%)	0.462	Fair agreement	< 0.05
III(4)	My buddy helps me arrange and prepare patient data	2 (13%)	3 (20%)	3 (20%)	4 (27%)	3 (20%)	2 (13%)	3 (20%)	3 (20%)	4 (27%)	3 (20%)	-0.078	No agreement	< 0.05
III(5A)	We collaboratively formulate examination strategies	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	1.000	Excellent agreement	< 0.05
III(5B)	I receive appropriate attribution and idea-sharing support from my buddy	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	1.000	Excellent agreement	< 0.05
III(5C)	Tasks assigned within the buddy system are executed efficiently	6 (40%)	6 (40%)	2 (13%)	1 (7%)	0 (0%)	6 (40%)	6 (40%)	2 (13%)	1 (7%)	0 (0%)	0.441	Fair agreement	< 0.05

n (%): Values are expressed as absolute numbers (n) with percentages (%) in parentheses. “Fellow Teacher” refers to senior residents; “Fellow Learner” refers to junior residents. Data shown represent Time 1 responses only. Kappa statistic represents test–retest measuring agreement between Time 1 and Time 2 responses (weighted Kappa used for ordinal data). Percentages were calculated out of the total respondents for each group (n = 15 for Fellow Teachers; n = 15 for Fellow Learners). Interpretation of Kappa: <0 = No agreement; 0.01–0.20 = Slight agreement; 0.21–0.40 = Fair agreement; 0.41–0.60 = Moderate agreement; 0.61–0.80 = Good agreement; 0.81–1.00 = Excellent agreement. p-value: A significance level of $p < 0.05$ was considered statistically significant.

Table 4. Attitudes and perceptions toward interpersonal skill development through the Buddy System

Q. No	Key Question	Fellow Teacher					Fellow Learner					Kappa	Result	*p*-value
		Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)			
IV(1)	The buddy system provides mental and psychological support	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	3 (20%)	5 (33%)	3 (20%)	2 (13%)	2 (13%)	0.321	Slight agreement	< 0.05
IV(2)	My pre-exam stress reduces with support from my buddy	3 (20%)	4 (27%)	4 (27%)	2 (13%)	2 (13%)	3 (20%)	4 (27%)	4 (27%)	2 (13%)	2 (13%)	0.290	Slight agreement	< 0.05
IV(3)	My confidence increases through interactions with my buddy	3 (20%)	5 (33%)	4 (27%)	2 (13%)	1 (7%)	3 (20%)	5 (33%)	4 (27%)	2 (13%)	1 (7%)	0.373	Slight agreement	< 0.05
IV(4)	The buddy system motivates me toward self-development	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)	4 (27%)	5 (33%)	3 (20%)	2 (13%)	1 (7%)	0.448	Fair agreement	< 0.05
IV(5A)	I can make better patient-care decisions through buddy discussions	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	1.000	Excellent agreement	< 0.05
IV(5B)	I can make better academic decisions with my buddy's support	6 (40%)	6 (40%)	2 (13%)	1 (7%)	0 (0%)	6 (40%)	6 (40%)	2 (13%)	1 (7%)	0 (0%)	0.651	Good agreement	< 0.05
IV(5C)	The buddy system strengthens decision-making in teaching–learning contexts.	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	7 (47%)	6 (40%)	2 (13%)	0 (0%)	0 (0%)	1.000	Excellent agreement	< 0.05
Overall	Summary	-	-	-	-	-	-	-	-	-	-	0.705	Good agreement	< 0.05

n (%): Values are expressed as absolute numbers (n) with percentages (%) in parentheses. "Fellow Teacher" refers to senior residents; "Fellow Learner" refers to junior residents. Data shown represent Time 1 responses only. Kappa statistic represents test–retest measuring agreement between Time 1 and Time 2 responses (weighted Kappa used for ordinal data). Percentages were calculated out of the total respondents for each group (n = 15 for Fellow Teachers; n = 15 for Fellow Learners). Interpretation of Kappa: <0 = No agreement; 0.01–0.20 = Slight agreement; 0.21–0.40 = Fair agreement; 0.41–0.60 = Moderate agreement; 0.61–0.80 = Good agreement; 0.81–1.00 = Excellent agreement. p-value: A significance level of $p < 0.05$ was considered statistically significant

Table 5. Cumulative Kappa depicting feasibility and acceptance for buddy system

Category / Domain	**Kappa Value**	**Interpretation**	**p-value**
Category I – Theoretical Skills	0.694	Good agreement	< 0.001
Category II – Practical Skills	0.683	Good agreement	< 0.001
Category III – Performance-Based Skills	0.441	Fair agreement	< 0.001
Category IV – Interpersonal Skills	0.705	Good agreement	< 0.001
Overall Cumulative Agreement	0.996	Excellent agreement	< 0.001

Interpretation of Kappa: <0 = No agreement; 0.01–0.20 = Slight agreement; 0.21–0.40 = Fair agreement; 0.41–0.60 = Moderate agreement; 0.61–0.80 = Good agreement; 0.81–1.00 = Excellent agreement. p-value: A significance level of $p < 0.05$ was considered statistically significant