



Implementing Interprofessional Education in Preclinical Curriculum Increases Teamwork, Ethics, and Professional Skills in Healthcare Students

Jegathambigai Rameshwar Naidu ^{1,2*}, Ciraj Ali Mohammed ³, M Ganesh Kamath ⁴

Abstract

Background: Interprofessional Education (IPE) fosters collaboration among healthcare professionals to enhance patient care. This study aimed to develop a Personal and Professional Development (PPD) module using an IPE approach for preclinical medical and dental students to cultivate essential competencies such as teamwork, communication, and leadership from early training. **Methods:** This mixed-method study involved a needs assessment survey among 307 medical and 124 dental preclinical students at a tertiary healthcare university in Malaysia. The Readiness for Interprofessional Learning Scale (RIPLS) was used to assess attitudes towards IPE. A PPD module was developed and validated using the Delphi method with input from an IPE team. Implementation involved an IPE PPD training workshop for 70 students, incorporating interactive learning activities. Pre- and post-tests, along with reflective summaries, were used for evaluation. **Results:** The needs assessment showed readiness for IPE, with mean RIPLS scores of 4.56 for MBBS and 4.35 for BDS students. The module achieved significant content validity (SCVI > 0.9). Post-implementation results demonstrated a significant

improvement in test scores ($p < 0.01$). Thematic analysis of reflective summaries indicated enhanced competencies in teamwork, communication, leadership, and professionalism. **Conclusion:** The IPE-based PPD module effectively fostered key competencies among preclinical students, supporting the integration of IPE in early medical education to prepare students for collaborative practice in clinical settings.

Keywords: Interprofessional Education (IPE), Preclinical Medical Students, Teamwork and Collaboration, Professional Development, Healthcare Education

Introduction

Interprofessional education (IPE) is a crucial approach for training medical graduates to work effectively in collaborative teams. According to Scaffa (2007), IPE "occurs when two or more professions learn about, from, and with each other to improve collaboration and the quality of care." Studies have shown that interprofessional learning can have positive outcomes when teaching pre-clinical students from various healthcare professions, such as medicine and nursing (Vuurberg et al., 2019). Traditional educational models have often trained healthcare team members in isolation, resulting in professionals who, upon entering clinical settings, lack an understanding of how each team member contributes to patient care (Institute of Medicine, 2004).

Preclinical students in medical schools without IPE are typically

Significance | This study demonstrated IPE's impact on fostering teamwork, ethics, and leadership among preclinical healthcare students for improved patient care.

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trained in silos, while clinical students experience interprofessional education in hospitals and community centers (Salomeh et al., 2017). Recent studies suggest that preclinical medical students show a readiness for interprofessional education similar to that of clinical students (Curran & Sharpe, 2007). A curriculum focused on personal and professional development (PPD) emphasizes humanistic values and ethics in medical education, paving the way for utilizing IPE as a teaching approach (Kavitha & Ashok, 2020; Alla et al., 2016). Teaching PPD through conventional methods may not effectively change student behavior and attitudes in clinical settings (Swick et al., 1999; Bridges et al., 2011).

Integrating an IPE approach into the PPD curriculum from the early preclinical phase can foster competencies such as teamwork, leadership, consensus-building, and communication skills, enabling students to achieve common patient care goals during clinical years (Buring et al., 2009; Parsell & Bligh, 1999). Introducing an IPE approach in the PPD module during the preclinical phase will also promote continuous training in professionalism from the first to the fifth year of medical education. Through this approach, preclinical medical and dental students can be trained holistically, learning from and about each other, which helps them build knowledge and professional skills early on and remain connected through their clinical years.

This method encourages teamwork, leadership skills, ethics, and professionalism from the start, reinforcing these skills during the clinical phase. The PPD module should include core competencies such as teamwork, ethics, role clarification, communication skills, and collaborative leadership. Without IPE, medical students, particularly in their preclinical years, may miss opportunities to develop these skills, limiting their effectiveness as team players (Acquavita et al., 2014; Lyons & Giordano et al., 2016).

The present study aimed to develop a PPD module for preclinical healthcare students using an IPE approach. The study involved a needs assessment survey, the development and validation of the PPD module, and its implementation through IPE training.

2. Materials and Methods

This study was a mixed mode study with purposive sampling method. The study was conducted in a tertiary health care University College Malaysia. The study participants included medical and dental pre-clinical students studying in year 1 and year 2.

2.1 Needs assessment survey

To investigate the perception and attitude of preclinical about interprofessional education, a need assessment survey was conducted. Three hundred seven pre-clinical medical students and one hundred twenty-four pre-clinical dental students made up the study population. The study population was chosen using a purposeful sampling strategy. The institution's ethics board granted

permission for the conduct of this study. The information was gathered in November 2022. A self-administered survey was given to the participants. The study's objectives, the confidentiality of the data gathered, and the process for obtaining informed consent were all described to all participants. To explore the students' attitude and perceptions towards IPE, we used the Readiness for Interprofessional Learning Scale (RIPLS). The 19 items of this questionnaire assessed students' attitudes towards IPE along three dimensions: roles and responsibilities (items seventeen through nineteen), professional identity (items ten through sixteen), and teamwork and collaboration (items one through nine).¹⁰ There are five options—from strongly agree to strongly disagree—for each topic in the survey. Scores for the alternatives ranging from positively to negatively were determined using a five-point scale. The points were awarded in reverse order for items ten through thirteen because they were negative assertions. Each item's mean value was computed. Using SPSS's descriptive statistics, the data was examined. A student t test for independent variables and a p-value were used to compare the mean scores of the two groups (Medical and Dental). were compared using student t test for independent variables and a p value of <0.05 was considered statistically significant.

2.2. Development and validation of the PPD module

The PPD module was developed by the IPE team which included members from Health care management, Nursing, Business Management, community medicine, medical and dental, foundation studies. The module was developed based on the key learning outcomes to be achieved and existing PPD curriculum. The module included the topics, learning outcome and learning activities. The Delphi method was used for the validation of the module. Informed consent was obtained from the IPE team. This was followed by the distribution of Delphi questionnaire and module. Three rounds of Delphi meetings were conducted. Submission of responses by the IPE team was done. Final consensus was obtained after summarizing the feedback at each round. Finally, the responses were summarized and incorporated in the module.

2.3. Implementation of PPD module for preclinical MBBS and BDS students.

The implementation of the module was done by organizing an IPE PPD training workshop to deliver for the MBBS/BDS students. 70 students participated in this training. Additionally, 10 nursing students were also included in the groups to create the IPE effect. The IPE PPD workshop was conducted for 2 days. The participants were divided into 7 groups with 10 members in each group. Each group included an equal number MBBS, BDS students and 1 nursing student. They were asked to fill in a pretest questionnaire. The training included teaching activities like interactive lectures, small group discussions, case presentations, team-based learning, Games, reflections etc.

4. Evaluation of the PPD module based on IPE

Evaluation of the IPE training module was done by utilizing the following tools.

1. Pre and post-test questionnaire.
2. Reflective summary (Thematic analysis)

The participants were asked to fill in the Pretest questionnaire individually at the beginning of the training session. The responses were collected. Upon the completion of the training module on the second day of the training, post-test questionnaire was administered to the participants. Reflective summaries were also collected from the participants by structured reflective summary questionnaire.

3. Results

3.1 Needs assessment for preclinical students.

Three hundred seven students including Medical and Dental programmes, voluntarily participated in this survey, with a 95% response rate. Eighty-three (183) of them were in the first year of MBBS while one hundred twenty-four (124) were in the first year of BDS. In our study, the average RIPLS score for MBBS students was found to be 4.56 and for BDS students was 4.35. This demonstrates the readiness of the students for IPE.

The mean scores for teamwork and collaboration were found to be 4.52 for MBBS and 4.39 for BDS. This shows the positive attitude towards IPE of all the students. For positive professional identity, the mean scores of the Medical and Dental students were found to be 4.61 and 4.3. Both groups received the lowest scores on this subscale roles and responsibilities. (Table 1)

3.2 Development and validation of PPD module based on IPE.

Development of the PPD module

The PPD module aimed to deliver core competencies such as teamwork, ethics and professionalism, communication skills, collaborative leadership through IPE approach. The pedagogic tools used in this module are designed to help the learner acquire propositional knowledge, personal knowledge, and process knowledge (knowing how to accomplish a task, including meat processing and reflection). Apart from plenary lectures, interactive lectures by experts, small group discussions, role plays, teamwork, and games are employed. The IPE PPD module was developed based on the key learning outcomes to be achieved. The module included the topics, learning outcome and learning activities (Table 2 & 3).

The course objectives aimed to provide a comprehensive understanding of several key concepts essential for medical education. These objectives included gaining a clear understanding of the interprofessional education (IPE) concept and its relevance in healthcare. The course also sought to help participants recognize and demonstrate various communication styles, enabling them to identify their own style of communication. Additionally, the course

emphasized the importance of understanding different types of leadership skills and learning the principles and responsibilities associated with medical professionalism. Finally, the objectives included developing a deep understanding of teamwork skills and group dynamics, which are crucial for effective collaboration in healthcare settings.

Validation of the PPD module.

The IPE team consisted of members from Medical, Dental, Nursing, Health care management, Community Medicine, Business management. The validation of the PPD module based on IPE was done by the IPE team. Delphi method was used for the validation of the module. Informed consent was obtained from the IPE team members. This was followed by the distribution of Delphi questionnaire and PPD module. Three rounds of Delphi meetings were conducted consecutively. The responses were collected at the end of each round. Final consensus was obtained after summarizing the feedback at each round. Finally, the responses were summarized and incorporated in the module. Content validity for the module was found to be significant. Scale content validity index (SCVI) for the module was found to be greater than 0.9.

Implementation of the module.

The implementation of the module was done by organizing an introductory IPE PPD training to deliver the content for the participants which included Medical and Dental students. 70 students participated in this training. Additionally, 10 nursing students were also added to the groups to give IPE effect. The IPE PPD workshop was conducted for 2 days. The participants were asked to fill in a pre-test questionnaire. The training included teaching activities like interactive lecture, small group discussions, case presentations, team-based learning, Games, reflections etc.

Evaluation of the PPD Module

Evaluation of the IPE training module was done by utilizing the pre & post-test which was conducted before and after the training. Reflective summaries were also collected at the end of the training.

Pre-test and Post test

The results of the total percentage scores of the pre-test and post-test which were conducted before and after the IPE PPD training indicated a significant difference ($P < 0.01$) in the test score percentage for pre-test and post-test as shown in Table 4.

Reflective summary

Thematic analysis of the reflective summaries from the participants who attended the training indicated the benefits gained by the students in acquiring the IPE knowledge, teamwork, communication skills, leadership skills, ethics, and professionalism (27%). They have stated that, I have learnt about interprofessional team and how to create collaborative environment (30%). Learnt about teamwork, ethics, professionalism, how Interprofessional leaning in leadership skills and importance of communication. Finally, they also stated that I will utilize the knowledge for my

career in future (40%). It is suitable in workplace where interprofessional teamwork is needed to provide good service to patients. Gained knowledge in IPE, teamwork, communication skills leadership skills, ethics, and professionalism. (27%) Figure 1.

4. Discussion

Interprofessional learning (IPL) is an effective approach that enhances the efficacy of collaborative healthcare practices by encouraging students to understand their primary responsibilities in relation to their work and the roles of other professionals within their team. Recent research from a Malaysian university has demonstrated the benefits of IPL packages using simulation and scenario-based approaches. These packages foster a learning environment where students can learn from, about, and with each other while managing a patient as a team (Abdelaziz et al., 2021). Additionally, studies have reported the successful implementation of interprofessional education (IPE) in co-curricular modules for healthcare students during the preclinical phase in various Malaysian medical universities.

In our study, the mean Readiness for Interprofessional Learning Scale (RIPLS) score for MBBS students was 4.56, while it was 4.35 for BDS students. The average scores for cooperation and collaboration were 4.52 for medical students and 4.39 for dental students, indicating a strong understanding of the importance of teamwork and communication, with 83% of participants recognizing these as crucial elements. Furthermore, 91% of participants agreed that collaborative learning is essential, reflecting their readiness for IPL. However, 61% of participants acknowledged a negative professional identity, and 43% indicated a need to improve their skill set. Only 8% of participants expressed uncertainty about their professional commitments in terms of tasks and responsibilities. The lower scores in understanding roles and duties might be attributed to the participants being in the preclinical phase of their education.

These findings align with recent studies indicating that both professors and students have positive attitudes toward interprofessional education and are willing to engage in interprofessional practice (Jalina et al., 2017; Mohamed, 2021; Marta, Tri, & Adang, 2021). Previous research has also demonstrated the positive effects of teaching pre-clinical students from medicine and other healthcare professions through interprofessional learning approaches (Michael et al., 2017). Moreover, recent research conducted at a major Malaysian university revealed that preclinical medical students are equally eager for interprofessional education as clinical students (El-Awaisi et al., 2016). Another study highlighted that preclinical Doctor of Physical Therapy (DPT) students had significantly higher self-efficacy compared to those enrolled in standard programs,

indicating differences in self-efficacy and cultural competency (Mohamed, 2021).

Recent studies have further reflected that health profession students who completed foundational IPE courses in their early education levels demonstrated more positive attitudes and learning outcomes. These courses helped shape students' professional identities, collaborative behaviors, and understanding of systems of care (Buring et al., 2009; Parsell & Bligh, 1999). Studies on interprofessional learning have reported positive outcomes in teaching pre-clinical students from medicine and other healthcare professions (Acquavita et al., 2014). There is a global need to incorporate IPE into medical curricula to strengthen teamwork and collaborative practice (Michael et al., 2017; Lyons & Giordano, 2016).

The Professional and Personal Development (PPD) module, based on the Interprofessional Education (IPE) framework, is designed to develop core competencies such as teamwork, ethics and professionalism, communication skills, and collaborative leadership. The pedagogic tools utilized in this module are intended to help learners acquire various types of knowledge, including propositional knowledge (facts and information), personal knowledge (self-awareness and understanding), and process knowledge (skills and techniques for accomplishing tasks, including reflective practice) (Curran et al., 2017; Frenk et al., 2010). The module employs a variety of teaching methods, including plenary and interactive lectures by experts, small group discussions, role plays, teamwork activities, and educational games, which are aimed at fostering a comprehensive learning environment. The module content encompasses specific topics, defined learning outcomes, and corresponding learning activities (Barr et al., 2005).

To implement the module, an IPE PPD training workshop was organized for medical and dental students, with 70 students participating in the training. This group also included 10 nursing students from another private medical university, incorporating external IPE members to enhance the interprofessional learning experience. The training comprised various teaching activities such as interactive lectures, small group discussions, case presentations, team-based learning, games, and reflective exercises, all of which aimed to build interprofessional competencies (D'eon et al., 2011; Reeves et al., 2016).

The evaluation of the IPE training module was conducted using a combination of pre- and post-test questionnaires and reflective summaries. The results indicated a significant improvement in the test scores after the training, with a marked difference ($P < 0.01$) between the pre-test and post-test scores, highlighting the module's effectiveness in enhancing student learning (Thistlethwaite et al., 2012). Thematic analysis of the reflective summaries from participants revealed several benefits gained through the training,

Table 1. Comparison of the RIPLS between Medical and Dental students

Variable	Medical Mean (SD)	Dental Mean (SD)	P value
Teamwork & collaboration	40.2 ±3.9	39.1± 4.7	0.023
Professional identity	29.9± 3.7	28.0±4.0	<0.001
Roles & responsibility	9.2 ± 1.8	8.9± 2.1	NS
Total score	79.3 (7.3)	76.1 (8.4)	0.001

(95% confidence interval -4.97 to -1.38), P value 0.001)

Table 2. Course duration

Mode of delivery / TLM /Activity	Topics	Contact hours
IPE Interactive lectures (Menti.com)	❖ IPE Introductory	1
	❖ Communication skills	1
	❖ Leadership skills	2
(Cased based learning role plays, SGD, Reflective summary)	& Role clarification	2
	❖ Teamwork	2
(IPE experts/ invited speakers)	❖ Ethics & Professionalism	
(Delivered by multi-disciplinary faculties)	Feedback & Evaluation,	1
Feedback evaluation of module	❖ Pre-post-test questionnaire	
	❖ Feedback & Assessment tools for IPE competency (Sub scales – JTOG Communication skill, Teamwork, Leadership skills, professionalism)	
	❖ Reflective summaries	

Table 3. Course Topics

Topics	Learning Outcomes	Activities you plan
Introduction to the module	<ul style="list-style-type: none"> To understand the module structure and list of topics 	Course Briefing
Introduction to IPE	<ul style="list-style-type: none"> To understand the IPE concept & principles To learn the advantages of IPL ❖ To know the role of team members in IPL 	<ul style="list-style-type: none"> Provide audio visual learning materials Menti.com Presentation SGD Reflection on the game
Communication skills	<ul style="list-style-type: none"> To define verbal/ Non-verbal communication To describe different verbal/ nonverbal cues, To describe consequences of verbal/ Non-verbal communication To perform appropriate verbal/ nonverbal communication to the patient and the colleagues To become a better communicator by examining the key ingredients to communication with special emphasis on verbal communication skills To demonstrate various communication styles and identify your communication style 	Give audio visual learning materials. Role play Reflection on the game <ul style="list-style-type: none"> Group activity: Role play as Speaker, Listener and Observer (verbal/ nonverbal communication)
Leadership skills	<ul style="list-style-type: none"> Understand the types of leadership styles. identify traits of a good leader 2. describe leadership role at health care set ups Medical Student as a Leader Comprehend the types of leadership skills. Identify the leadership skills Demonstrate group dynamics	Group activity: Discuss reflections of group leaders / summary of activity in large group)
Teamwork	<ul style="list-style-type: none"> To understand the Importance of teamwork To know the role of team members in IPL. 	Group activity in team building & presentation.
Professionalism	<ul style="list-style-type: none"> Principles and responsibilities attached to medical professionalism. Empathy Interpersonal relationship Professionalism through prism of portfolio. Define Professionalism and learn to self-assess Describe Academic Honesty among students. Describe how professional behaviors and attitudes help students to be successful doctor. soft skills & Professionalism 	Give audio visual learning materials. Small group activity Reflection on stories Menti.com Reflections
Medical ethics	<ul style="list-style-type: none"> To understand the concept & principles of medical ethics 	Give audio visual learning materials. Case studies -Group activity
Feedback & Evaluation	<ul style="list-style-type: none"> Pre posttest questionnaire ❖ Feedback & Assessment tools for IPE competency • Reflective summaries 	

Table 4. Comparison of pretest and post test scores

Pre-test score	Post test score	P value	Sig
56.9±17.3	84.2±11.2	0.0006*	P<0.01

Value represents mean score ± sd for the pretest and posttest of the participants.

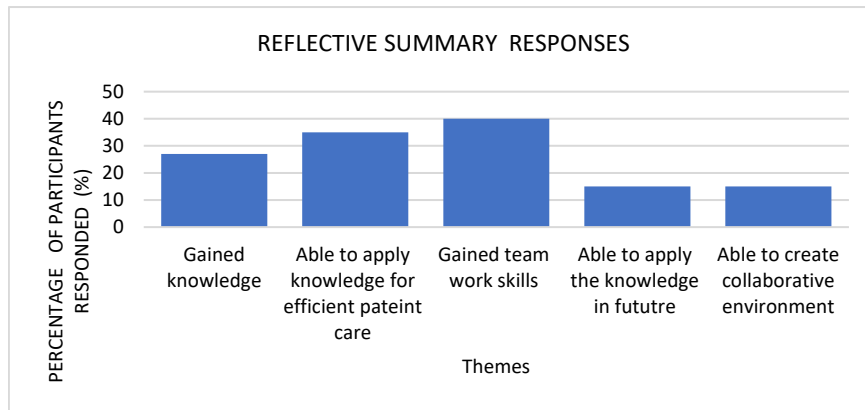


Figure 1. Thematic analysis of the reflective summaries of the participants. Values represent percentage of participants.

including improved understanding of IPE, enhanced teamwork and communication skills, strengthened leadership abilities, and a deeper appreciation of ethics and professionalism. Participants reported, "I have learned about interprofessional teams and how to create a collaborative environment," and expressed their intent to utilize this knowledge in their future careers. They noted that such training is particularly relevant in workplaces where interprofessional teamwork is essential for providing high-quality patient care (Lapkin et al., 2013; Steinert, 2005).

These findings align with previous research that emphasizes the value of interprofessional education in fostering collaborative practice and improving healthcare outcomes (World Health Organization, 2010; Barr et al., 2009). The module demonstrates that incorporating diverse learning methods and reflective practices can significantly enhance students' readiness for collaborative work in healthcare settings.

5. Conclusion

The implementation of an Interprofessional Education (IPE) approach in the Personal and Professional Development (PPD) curriculum for preclinical medical and dental students shows promising outcomes in fostering core competencies such as teamwork, communication skills, leadership, ethics, and professionalism. The readiness of preclinical students for IPE, as indicated by high scores on the Readiness for Interprofessional Learning Scale (RIPLS), demonstrates a positive attitude towards collaborative learning. The mixed-methods study effectively assessed the students' perceptions and successfully developed, validated, and implemented the PPD module through workshops and team-based activities. The significant improvement in pre- and post-test scores and positive feedback from reflective summaries emphasize the effectiveness of the IPE-based PPD module. This study underscores the need to incorporate IPE in the preclinical phase to enhance the readiness and effectiveness of healthcare professionals in multidisciplinary settings, ultimately improving patient care outcomes.

Author contributions

J.R.N. was responsible for the conceptualization and drafting of the manuscript. C.A.M. contributed to the data analysis and critical revisions. M.G.K. participated in the review and editing process. All authors reviewed and approved the final manuscript.

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Competing financial interests

The authors have no conflict of interest.

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