COMMENTARY
Volume 16 Issue 2 2024
DOI: 10.21315/eimj2024.16.2.12
ARTICLE INFO
Received: 19-02-2024
Accepted: 10-03-2024
Online: 28-06-2024

Interprofessional Anatomy Education: Its Significance, Challenges and Recommendations

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To cite this article: Mat Nawi NF, Hadie SNH. Interprofessional anatomy education: its significance, challenges and recommendations. Education in Medicine Journal. 2024;16(2):165–176. https://doi.org/10.21315/eimj2024.16.2.12

To link to this article: https://doi.org/10.21315/eimj2024.16.2.12

ABSTRACT

Interprofessional education (IPE) is increasingly recognised as essential for preparing healthcare professionals to work collaboratively in interdisciplinary teams. In the realm of anatomy education, integrating IPE offers unique opportunities to enhance students' understanding of the human body and its clinical relevance while fostering essential teamwork and communication skills. This commentary underscores the pivotal role of IPE in anatomy curricula, highlighting its capacity to cultivate collaboration among students from various healthcare disciplines and enhance patient care by equipping students to apply anatomical knowledge in interdisciplinary settings. Through interprofessional learning experiences, students develop critical thinking skills and gain a deeper understanding of how anatomy knowledge and skills are translated into patient care, fostering effective problem-solving and clinical reasoning within collaborative teams. Despite the potential benefits, challenges such as curricular integration, logistical barriers, faculty resistance, assessment complexity, resource constraint, and variations in institutional cultures and policies, must be addressed to effectively implement IPE in anatomy education. Overcoming these challenges involves prioritising interdisciplinary collaboration, establishing interdisciplinary curricular models, promoting interprofessional relationships, developing innovative assessment strategies providing faculty development opportunities, and addressing resource constraints. By addressing challenges and implementing recommendations, institutions can create meaningful learning experiences that enhance students' abilities to work effectively in interdisciplinary teams and improve patient care outcomes.

Keywords: *Anatomy education, Interprofessional education, Interdisciplinary learning, Collaborative practice, Healthcare professionals*

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INTRODUCTION

Anatomy education serves as the foundational cornerstone of healthcare professions, providing students with essential knowledge of the structure and functions of the human body. However, the traditional siloed approach to teaching anatomy often overlooks the

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importance of collaboration among healthcare professionals. Interprofessional education (IPE) is a crucial pedagogical tool for equipping students in health professions to deliver patient care within a collaborative team setting. The World Health Organization (WHO) states that "IPE occurs when two or more professionals learn about, from and with each other to enable effective collaboration and improve health outcomes" (1–3). The WHO acknowledges the significance of interprofessional collaboration in both education and practice as a novel approach that will have a significant impact on addressing global health challenges. Collaboration takes place when individuals with complementary skills from varying backgrounds come together to foster a mutual understanding that is beyond their individual capacities (1). The goal of IPE is for students to learn how to function in an interprofessional team and carry their knowledge, skills and values into their future practice. An interprofessional team comprises members from different health professions working collaboratively to provide patient-centred care with a common goal. Joint decision-making and individual leadership on patient care issues are encouraged within the team structure. This approach contrasts with conventional models that does not allow enough collaboration, which may lead to overlap and conflict in care (1, 4). Five core competencies of IPE include roles and responsibilities, ethical practice, conflict resolution, communication, collaboration and teamwork (2).

Interdisciplinary learning involves incorporating knowledge from multiple disciplines around a central programme, theme or focus (5). It can take place in various settings, such as large lectures, small group discussions, simulated scenarios and clinical settings (2). Higher levels of structural knowledge are associated with improved comprehension, memory retention and problem-solving. Interdisciplinary learning fosters an integration of problem-focused information, consistent with more complex knowledge structures. Hence, it offers a more comprehensive treatment and a deeper understanding of key topics and concepts spanning multiple disciplines. It also improves metacognitive skills, critical thinking and personal epistemology, leading to personalised integration of knowledge and the ability to apply knowledge in various situations (5).

According to WHO (1), through the Framework of Action on Interprofessional Education and Collaborative Practice, IPE is influenced by educators and curricula themselves. Educators are responsible for creating, providing, financing and managing professional training. Developing new curricula, such as IPE, is a complex process involving staff members from different faculties, work settings and locations who coordinate lessons and instructions to produce the curricula that meet IPE educational objectives. Sustaining IPE requires supportive institutional policies, managerial commitment, communication between stakeholders, enthusiasm for individual work, a shared vision, a grasp of the advantages of implementing a new curriculum and an understanding of the responsibility to coordinate education activities and identify barriers to progress (1). Regarding the curriculum mechanism, healthcare and education globally involve various professionals providing various services at different times and places, requiring coordination among curriculum developers and educators (1). Factors influencing the effectiveness of IPE include using the principles of adult learning, such as problem-based learning (PBL) and action learning sets, incorporating real-world practices and experiences into learning methods and facilitating interactions between students (1). A systematic review and meta-analysis by Guraya and Barr (6) on the effectiveness of IPE in healthcare reveal positive results in the enhancement of learners' understanding of, skills in and attitudes towards collaborative teamwork.

In the context of anatomy education, the effective integration of IPE relies on addressing various inherent factors and challenges in leveraging key principles of collaborative learning in the anatomy education system. Despite difficulties in integrating IPE, a rising number of students who enrolled for anatomy courses in IPE was observed each semester (6). Hence, a coordinated effort from administration and faculty is required to schedule, make a timetable, allocate adequate time and locate suitable teaching resources to meet the needs (6). A recent study on interprofessional collaboration among 75 medical students and 38 physiotherapy students watching an online-based applied anatomy video has shown notable improvement in students' attitudes towards interprofessional learning, evaluation of professional responsibilities and profession-specific knowledge (7). A study by Huebner et al. (8) depicted positive attitudes of first-year health science students in dentistry, medicine, nursing, nutrition, pharmacy and physiotherapy towards IPE in gross anatomy courses. A study by Hamilton et al. (9) involving first-year physical therapy students and medical students taking gross anatomy courses revealed a positive impact on future collaborations, as students from both programmes acknowledged the value of disciplinary teamwork, which led them to conduct independent planning of informal study sessions and interactions.

Various approaches can be employed to integrate IPE into anatomy curricula. Interdisciplinary anatomy courses offer students the chance to study anatomical concepts together, fostering a shared understanding of the human body's complexities. The most common approaches employed when implementing IPE in undergraduate teaching and learning were small group discussions, team-based learning (TBL), PBL and case-based learning (CBL) (2, 3). Small group discussions and teachings provide an efficient method for promoting IPE in the educational setting, as they offer greater adaptability, personalised learning opportunities, enhanced engagement and active involvement (2). Close interaction among students promotes a community-like environment, social interaction and a shared sense of identity, resulting in a more meaningful educational experience (2). The research conducted by Burgess et al. (10), involving first-year medical students and second-year physiotherapy students who were required to participate in an interprofessional musculoskeletal TBL session, revealed that student learning was enhanced, their clinical reasoning skills were fostered and their understanding of the importance of multidisciplinary teams in patient care was enhanced.

Interprofessional dissection labs provide hands-on learning experiences where students from different disciplines collaborate to explore anatomical structures and the clinical significance of the structures and honed their teaching skills via peer teaching. The sessions offer an opportunity for students from different programmes to understand each other's training levels and appreciate the differences between their disciplines while working towards the same goal (11). Additionally, simulation-based exercises—fit for all types of learners, including divergent learners, assimilating learners, converging learners and accommodating learners—further enhance interprofessional collaboration by simulating real-world clinical environments and promoting information exchange among students (3). It offers a safe and controlled setting for students of various professions to engage in collaborative learning, mirroring real-life clinical scenarios while receiving appropriate guidance (12). Despite the benefits of IPE in anatomy education, several barriers and challenges hinder its implementation. In this commentary, we explore the challenges of integrating IPE into anatomy curricula and discuss strategies for fostering collaborative learning experiences.

THE SIGNIFICANCE OF IPE IN ANATOMY EDUCATION

IPE brings together students from diverse healthcare disciplines, such as medicine, nursing, pharmacy and allied health, to learn with, from and about each other. By incorporating IPE into anatomy education, students gain opportunities to develop essential teamwork, communication and mutual respect skills for effective interdisciplinary collaboration in clinical practice. Implementation of IPE in teaching changes the mindset and perception among different professions related to anatomy education, resulting in reduced anxiety during future professional collaboration (11). Early exposure to IPE during training prepares students for future integration of interprofessional collaboration in their future endeavours (13).

Additionally, anatomy plays an important role in ensuring safe clinical practice and holistic patient care, which can be achieved via IPE approaches. Students learn to apply their anatomical knowledge within an interdisciplinary context, promoting a deeper understanding of how different healthcare professions contribute to patient diagnosis, treatment and management (14). By engaging in interprofessional learning experiences, students can apply their anatomical knowledge to solve complex clinical problems, fostering critical thinking and clinical reasoning skills within a team-based context (11, 15). This form of interdisciplinary problem-solving creates critical thinking skills that allow the application of anatomy knowledge. For instance, learning within the interdisciplinary team requires students to adapt and translate their anatomy knowledge at various levels in an attempt to solve problems (16). In an IPE setting, students might face conflicts among themselves, a situation which requires them to think critically to manage the conflicts and resolve disagreements that may arise within their interdisciplinary teams. Apart from that, learning in an interprofessional environment promotes students to recognise the relationship of various components within the learning domain healthcare system, and thus enhance their critical thinking skills (12, 16).

Furthermore, IPE-based anatomy instructions promote communication skills among students, ensuring seamless coordination among healthcare team members (11). IPE in anatomy education provides students with opportunities to practice communicating complex anatomical concepts and clinical findings to colleagues from other disciplines, thus enhancing their ability to collaborate effectively in future practice settings. For example, good communication skills between physiotherapists and medical doctors are indispensable in caring for patients with musculoskeletal diseases. Hence, a good understanding of each other's roles in their undergraduate years will enthuse them to strengthen their communication skills besides establishing their understanding of human anatomy and its role in the pathogenesis of the disease (9, 15).

Moreover, interprofessional anatomy education prepares students for interprofessional medical practice, where students have efficient interaction with one another in patient management. Students are able to gain exposure to the complexity of real-world patient cases and learn to approach them from a multidisciplinary perspective, ultimately improving their ability to provide comprehensive and coordinated care (9). In today's healthcare environment, interdisciplinary collaboration is increasingly emphasised as a means of improving patient outcomes and healthcare delivery. By engaging in IPE during anatomy education, medical students are better prepared to navigate interprofessional teamwork dynamics and contribute positively to collaborative practice even before entering their clinical phase of medical studies (11).

CHALLENGES AND CONSIDERATIONS

Despite the numerous benefits of integrating IPE into anatomy education, the implementation of these initiatives faces several challenges that must be addressed comprehensively. Various problems in different aspects, such as curricular integration, logistical barriers, faculty resistance, lack of knowledge and experience on IPE among faculty members and students, assessment complexity, resource constraints and variations in institutional cultures and policies, may hinder the implementation of interprofessional learning experiences (17). One major obstacle is the need for effective curricular integration, as embedding IPE effortlessly within existing curricula can be very complex (18). This method requires restructuring learning objectives, contents, pedagogical strategies and assessment methods across different health professions programmes, necessitating careful planning, coordination and collaboration across multiple academic departments and disciplines. Restructuring these elements besides existing curricular frameworks and ensuring continuity of contents across courses can be resource-intensive and time-consuming (19).

Consequently, coordinating schedules and preparing resources may pose as challenges and logistical barriers may arise in the administration of interprofessional learning experiences due to the inherent disparities in academic calendars, curricular requirements and the availability of faculty and facilities across various healthcare disciplines (20). For instance, aligning the timelines of medical, nursing and allied health programmes for anatomy syllabus can be intricate, as each discipline may have distinct anatomy learning outcomes, scheduling demands and academic calendars. Additionally, the collaborative dynamics among students from various medical and allied health programmes posed several challenges, as highlighted in the past literature (21–24). Significant time was devoted to elucidating individual viewpoints within the group, while difficulties in identifying shared skill sets were encountered to enhance anatomy learning (25). Hence, navigating differences in opinions and seeking peer assistance may present further obstacles.

Furthermore, anatomy educators may resist incorporating IPE into anatomy curricula due to concerns about workload, unfamiliarity with interprofessional teaching methods or disciplinary silos. It is well-known that anatomy educators carry a high workload as they balance teaching and student assessments with research activities and administrative tasks (26). A significant aspect of an anatomist's responsibilities includes hands-on dissections, as well as conducting research and experiments to elucidate fundamental and applied concepts of human biological systems, whether at macroscopic or microscopic levels (27). Teaching and administrative duties are demanding, given that anatomy syllabi in many institutions are extensive and content-driven (28). Anatomists often contribute to the design, review and updating of anatomy curricula to ensure that they align with educational standards, advancements in the field and the evolving needs of students, healthcare professionals and other stakeholders (29, 30). Nevertheless, anatomists may have limited exposure to IPE concepts and pedagogies, which can hinder their ability to effectively incorporate interprofessional elements into anatomy curricula (31). Similarly, students may lack an understanding of the importance and benefits of collaborative practice across disciplines, as well as practical experience working in interprofessional teams (32). This deficiency in knowledge and experience can lead to reluctance or resistance towards participating in IPE activities, perpetuating the cycle of unfamiliarity and hindering the integration of collaborative learning approaches into anatomy education.

Similarly, evaluating interprofessional competencies and determining the effectiveness of IPE on student learning outcomes within anatomy education presents challenges. Conventional assessment techniques in anatomy education may not adequately measure the collaborative and teamwork skills cultivated through interprofessional learning activities. Traditional assessment methods in anatomy education often focus on individual knowledge acquisition and retention, such as written exams, practical assessments and presentations. While these methods are valuable for assessing students' understanding of anatomical concepts, they may not adequately capture the collaborative and teamwork skills essential for interprofessional practice (33). The interprofessional competencies are multifaceted and extend beyond the acquisition of anatomical knowledge, whereby they encompass interpersonal skills, cultural competence, ethical decision-making and the ability to work effectively in diverse healthcare teams. Assessing these competencies requires a holistic approach that goes beyond traditional assessment methods (34).

Moreover, implementing IPE in anatomy initiatives demands additional resources to ensure their effectiveness. Inadequate funding to support the infrastructure, faculty training and ongoing development of IPE programmes may hinder IPE implementation. Without sufficient resources, institutions may struggle to fully realise the potential benefits of IPE and provide students with comprehensive, interdisciplinary learning experiences. Thus, addressing resource constraints is crucial for ensuring the successful implementation and sustainability of IPE initiatives within anatomy education settings. Therefore, a well-designed and evidenced-based model of IPE instruction is needed in anatomy education to enhance the applicability of IPE to those who are unfamiliar with IPE. Integrating conventional and indigenous healthcare practitioners and providers through the development and implementation of IPE models might enhance the value and outcomes of IPE (12, 35, 36). Educators play a crucial role in the success of IPE by actively involving themselves in establishing and demonstrating interprofessional collaboration for and among students, as it proved successful in cultivating professionalism in education (12).

Furthermore, the availability of financial resources directly impacts the breadth and depth of IPE initiatives (2). The successful implementation of IPE initiatives within anatomy education demands additional financial resources to ensure their effectiveness. Securing adequate funding to support the necessary infrastructure, faculty training and ongoing development of IPE programmes may present significant challenges (37). Insufficient resources can hinder the comprehensive integration of IPE into anatomy curricula and limit students' exposure to interdisciplinary learning experiences. Without sufficient funding, institutions may struggle to develop and maintain the required infrastructure for collaborative learning environments, such as technologically advanced simulation centres and conducive interprofessional learning spaces for team-based activities. Additionally, ongoing support and resources are necessary for the continuous improvement and sustainability of IPE programmes. Without dedicated resources for programme maintenance and development, institutions may risk stagnation and struggle to adapt to evolving anatomy education demands and educational standards.

Interestingly, institutional culture and policies may serve as barriers to interprofessional collaboration and interdisciplinary education. Hierarchies prevalent within academic institutions often mirror traditional power dynamics, inadvertently impeding collaboration. Within these structures, disciplinary boundaries may discourage faculty members from engaging with their colleagues in other fields, fearing a perceived disparity in status or expertise (34). Disciplinary silos may persist and impede collaboration, as departments often operate independently, adhering to their established norms and practices (35).

Moreover, institutional inertia exacerbates resistance to IPE within anatomy education. Bureaucratic processes, administrative approvals and entrenched norms often hinder the swift implementation of innovative initiatives, slowing down progress in integrating interdisciplinary approaches into educational practices (35). This resistance underscores the importance of addressing institutional culture and policies to foster a more conducive environment for collaborative learning and interdisciplinary collaboration within anatomy education settings.

RECOMMENDATIONS FOR IMPLEMENTATION

Despite the aforementioned challenges, integrating IPE into anatomy curricula holds promise to prepare future healthcare professionals to work collaboratively and effectively in interdisciplinary teams. Hence, addressing the challenges requires a multifaceted factor involving strategic planning, visionary leadership, institutional support, clear communication among interdisciplinary team members and commitment from all stakeholders.

Institutions should overcome the curricular integration issues and logistical barriers to achieve a successful integration of IPE into anatomy education. This institutional effort requires careful planning, collaboration between academic departments and flexibility in scheduling (36). Curriculum committees and academic leaders should be engaged in discussions about the importance of IPE and its integration into the curriculum (37). It is important to develop applicable and feasible interdisciplinary curricular models across contexts, where interdisciplinary teaching teams can facilitate curricular integration and promote a cohesive educational experience for students (2), thus, fostering a culture of collaboration and interdisciplinary teamwork within academic institutions.

Additionally, it is important to prioritise faculty development initiatives that provide educators with the necessary skills and knowledge to facilitate interprofessional learning experiences. Investing in faculty development is essential for cultivating educators' competencies in designing and facilitating interprofessional learning experiences (38). This includes training faculty members to effectively collaborate across disciplines, develop interprofessional curricula and assess students' interprofessional competencies (39). Faculty development programmes can play a pivotal role in promoting understanding and collaboration across fields. Providing faculty development opportunities, such as workshops, seminars and online resources related to interprofessional pedagogy, as well as incentives for participation, can help address these concerns and build faculty buy-in. These initiatives help faculty members gain the necessary skills and confidence to incorporate IPE into the anatomy curricula.

Besides, it is important to foster a culture of collaboration and interdisciplinary teamwork within the institution by promoting interprofessional relationships, breaking down disciplinary silos and advocating for institutional policies and structures that support IPE (14, 40). Stakeholders at all levels, including administrators, faculties, students and clinical partners, should be engaged in discussions on the importance of IPE and its integration into the institutional culture. This intentional effort can foster cross-disciplinary dialogue and mutual respect among interdisciplinary teaching teams when planning, designing and delivering interprofessional anatomy education materials (14). These collaborative planning sessions and regular communication among team members can ensure alignment of learning objectives, assessment methods and content delivery across disciplines. However, balancing the demands of various disciplines within a limited timeframe poses

logistical challenges. By identifying underlying fears and assumptions, a faculty can address seemingly intractable problems (41). Generating sufficient tension within the system may trigger breakthrough thinking and innovative solutions. Thus, embracing tensions and contradictions as levers for change can pave the way for effective IPE integration.

Ongoing assessment and feedback mechanisms need to be in place to ensure continuous improvement of the IPE programmes in anatomy education (42). Establishing valid and reliable assessment instruments is pertinent to ensure an accurate reflection of the interdisciplinary nature of IPE and effectively gauge students' abilities to collaborate, communicate, work and participate in a team within the context of anatomical studies (12). Anatomy educators must develop innovative assessment strategies that align with the goals of IPE and capture the full range of interprofessional competencies. Hence, a combination of formative and summative assessments, utilising various assessment tools, such as interprofessional team-based assessments through simulated interprofessional experience, peer and self-evaluations, reflective exercises and Objective Structured Clinical Examinations (OSCE), should be implemented to assess teamwork, communication and collaboration skills (42). Developing such assessments requires careful consideration of the unique aspects of interprofessional learning experiences and collaboration between anatomy educators and experts in various disciplines, including those who are experts in assessment design. Data on the achievement of student learning outcomes, students' satisfaction and their perceptions of interprofessional collaboration should be gathered to identify areas for enhancement and refinement of IPE initiatives, and subsequently assure informed practices in future (43).

On top of that, addressing resource constraints is crucial for ensuring the successful implementation and sustainability of IPE initiatives within anatomy education settings. Implementing IPE in anatomy initiatives demands additional resources to ensure their effectiveness, including securing funding for faculty development programmes aimed at enhancing interprofessional teaching skills, assessment methods and collaborative learning environments (44). Acquiring simulation equipment tailored to interprofessional scenarios and establishing dedicated interprofessional physical and virtual learning spaces are essential for facilitating hands-on, experiential learning opportunities (45). Leveraging technology and simulation-based learning tools can enhance the effectiveness of IPE and overcome logistical barriers. Institutions should seek institutional support and external funding opportunities to supplement existing resources and infrastructure for IPE. By implementing these recommendations, institutions can overcome the challenges associated with integrating IPE into anatomy curricula and create meaningful learning experiences that prepare future healthcare professionals for collaborative and patient-centred practice.

CONCLUSION

In conclusion, the integration of IPE into anatomy curricula holds immense potential for preparing future healthcare professionals to work collaboratively and effectively in interdisciplinary teams. By fostering collaboration among students from diverse healthcare disciplines, IPE in anatomy education promotes essential teamwork, communication skills and mutual respect necessary for delivering patient-centred care. Moreover, it enables students to apply their anatomical knowledge within an interdisciplinary context, facilitating a deeper understanding of how different healthcare professions contribute to patient diagnosis, treatment and management. Despite facing challenges during its implementation, the integration of IPE into anatomy education holds promise for enhancing student learning

outcomes and improving patient care. Hence, it is imperative for institutions to prioritise faculty development, allocate resources and create supportive environments to facilitate the successful implementation and sustainability of IPE initiatives. Through collaborative efforts and innovative approaches, anatomy educators can harness the transformative power of IPE to cultivate a new generation of healthcare professionals who are equipped with interprofessional collaborative learning experiences to meet the complex challenges of modern healthcare delivery.

REFERENCES

1. World Health Organization (WHO). Framework for action on interprofessional education and collaborative practice. health professions networks nursing and midwifery human resources for health [Internet]; 2010 [cited 2024 Jun 10]. Available from: https://www.who.int/publications/i/item/framework-for-action-on-interprofessional-education-collaborative-practice

2. van Diggele C, Roberts C, Burgess A, Mellis C. Interprofessional education: tips for design and implementation. BMC Med Educ. 2020;20(Suppl 2):455. https://doi.org/10.1186/s12909-020-02286-z

3. Aldriwesh MG, Alyousif SM, Alharbi NS. Undergraduate-level teaching and learning approaches for interprofessional education in the health professions: a systematic review. BMC Med Educ. 2022;22(1):13. https://doi.org/10.1186/s12909-021-03073-0

4. Buring SM, Bhushan A, Broeseker A, Conway S, Duncan-Hewitt W, Hansen L, et al. Interprofessional education: definitions, student competencies, and guidelines for implementation. Am J Pharm Educ. 2009;73(4):59.

5. Ivanitskaya L, Clark D, Montgomery G, Primeau R. Interdisciplinary learning: process and outcomes. Innov High Educ. 2002;27(2):95–111. https://doi.org/10.1023/A:1021105309984

6. Guraya SY, Barr H. The effectiveness of interprofessional education in healthcare: a systematic review and meta-analysis. Kaohsiung J Med Sci. 2018;34(3):160–5. https://doi.org/10.1016/j.kjms.2017.12.009

7. Grosser J, Bientzle M, Shiozawa T, Hirt B, Kimmerle J. Observing interprofessional collaboration: impact on attitude and knowledge acquisition. Anat Sci Educ. 2021;14(4):452–9. https://doi.org/10.1002/ase.2007

8. Huebner S, Tang Q (Chancy), Moisey L, Shevchuk Y, Mansell H. Establishing a baseline of interprofessional education perceptions in first year health science students. J Interprof Care. 2020;35(3):400–8. https://doi.org/10.1080/13561820.2020.1729706

9. Hamilton SS, Yuan BJ, Lachman N, Hellyer NJ, Krause DA, Hollman JH, et al. Interprofessional education in gross anatomy: experience with first-year medical and physical therapy students at Mayo Clinic. Anat Sci Educ. 2008;1(6):258–63. https://doi.org/10.1002/ase.59

10. Burgess A, Kalman E, Haq I, Leaver A, Roberts C, Bleasel J. Interprofessional team-based learning (TBL): how do students engage? BMC Med Educ. 2020;20(1):118. https://doi.org/10.1186/s12909-020-02024-5

11. Sytsma TT, Haller EP, Youdas JW, Krause DA, Hellyer NJ, Pawlina W, et al. Long-term effect of a short interprofessional education interaction between medical and physical therapy students. Anat Sci Educ. 2015;8(4):317–23. https://doi.org/10.1002/ase.1546

12. Samarasekera DD, Nyoni CN, Amaral E, Grant J. Challenges and opportunities in interprofessional education and practice. Lancet. 2022;400(10362):P1495–7. https://doi.org/10.1016/S0140-6736(22)02086-4

13. Gilbert JHV. Interprofessional learning and higher education structural barriers. J Interprof Care. 2005;19(Suppl 1):87–106. https://doi.org/10.1080/13561820500067132

14. Herrmann G, Woermann U, Schlegel C. Interprofessional education in anatomy: learning together in medical and nursing training. Anat Sci Educ. 2015;8(4):324–30. https://doi.org/10.1002/ase.1506

15. Blum GC, Richter R, Fuchs R, Sandeck F, Heermann S. An interprofessional teaching approach for medical and physical therapy students to learn functional anatomy and clinical examination of the lower spine and hip. Ann Anat. 2020;231:151534. https://doi.org/10.1016/j.aanat.2020.151534

16. Ciani GJ, Grimaldi G, Macalintal M, Orner D. The impact of interprofessional education on health profession students' professional identity. Educ Sci. 2023;13(5):494. https://doi.org/10.3390/educsci13050494

17. Smith CF, Hall S, Border S, Adds PJ, Finn GM. Interprofessional anatomy education in the United Kingdom and Ireland: perspectives from students and teachers. Anat Sci Educ. 2015;8(4):360–70. https://doi.org/10.1002/ase.1548

18. Grace S. Models of interprofessional education for healthcare students: a scoping review. J Interprof Care. 2021;35(5):771–83. https://doi.org/10.1080/13561820.2020.1767045

19. Fernandes AR, Palombella A, Salfi J, Wainman B. Dissecting through barriers: a mixed-methods study on the effect of interprofessional education in a dissection course with healthcare professional students. Anat Sci Educ. 2015;8(4):305–16. https://doi.org/10.1002/ase.1517

20. Mladenovic J, Tilden VP. Strategies for overcoming barriers to IPE at a health sciences university. J Interprof Educ Pract. 2017;8:10–3. https://doi.org/10.1016/j.xjep.2017.05.002

21. Johnson AM, Howell DM. International service learning and interprofessional education in Ecuador: findings from a phenomenology study with students from four professions. J Interprof Care. 2017;31(2):245–54. https://doi.org/10.1080/13561820.2016.1262337

22. O'Neill BJ, Wyness MA. Student voices on an interprofessional course. Med Teach. 2005;27(5):433–8. https://doi.org/10.1080/01421590500086680

23. Odole AC, Odunaiya NA, Ajadi OI. Interprofessional education among Nigerian clinical students: implications for interprofessional care. J Interprof Care. 2018;33(6):645–53. https://doi.org/10.1080/13561820.2018.1544545

24. Walker LE, Cross M, Barnett T. Students' experiences and perceptions of interprofessional education during rural placement: a mixed methods study. Nurse Educ Today. 2019;75:28–34. https://doi.org/10.1016/j.nedt.2018.12.012

25. Scrooby B, Reitsma GM, Waggie F. A practice model for interprofessional education in a first year anatomy class. J Interprof Care. 2019;33(3):313–20. https://doi.org/10.1080/13561820.2019.1596890

26. Wilson AB, Notebaert AJ, Schaefer AF, Moxham BJ, Stephens S, Mueller C, et al. A look at the anatomy educator job market: anatomists remain in short supply. Anat Sci Educ. 2020;13(1):91–101. https://doi.org/10.1002/ase.1895

27. Schaefer AF, Wilson AB, Barger JB, Azim HM, Brokaw JJ, Brooks WS. What does a modern anatomist look like? current trends in the training of anatomy educators. Anat Sci Educ. 2019;12(3):225–35. https://doi.org/10.1002/ase.1806

28. Syed Abd Halim SA, Yusoff MSB, Yaman MN, Razali SA, Tengku Muda TFM, Ramli RR, et al. Clinical students' reflections on the preclinical anatomy learning experience. J Taibah Univ Med Sci. 2023;18(4):757–70. https://doi.org/10.1016/j.jtumed.2022.12.007

29. Paulsen DF, Klement BJ, Wineski LE. Role of anatomists in building an integrated medical curriculum. In: Chan LK, Pawlina W, editors. Teaching anatomy: a practical guide. Cham: Springer; 2020. p. 473–82. https://doi.org/10.1007/978-3-030-43283-6_46

30. Evans DJR. The role of the anatomist in communicating anatomy to a lay audience. Eur J Anat. 2007;11(S1):79–83.

31. Mackinnon C, Akhtar-Danesh N, Palombella A, Wainman B. Using Q-methodology to determine students' perceptions of interprofessional anatomy education. Anat Sci Educ. 2022;15(5):877–85. https://doi.org/10.1002/ase.2109

32. Rose MA, Smith K, Veloski JJ, Lyons KJ, Umland E, Arenson CA. Attitudes of students in medicine, nursing, occupational therapy, and physical therapy toward interprofessional education. J Allied Health. 2009;38(4):196–200.

33. Hadie SNH. The application of learning taxonomy in anatomy assessment in medical school. Educ Med J. 2018;10(1):13–23. https://doi.org/10.21315/eimj2018.10.1.3

34. Brenner E, Chirculescu ARM, Reblet C, Smith C. Assessment in anatomy. Eur J Anat. 2015;19(1):105–24.

35. Sindhu S. Interprofessional education and collaborative practice: need of the hour. Natl J Pharmacol Ther. 2023;1(1):18–21.

36. O'Leary N, Salmon N, O'Donnell M, Murphy S, Mannion J. Interprofessional education and practice guide: profiling readiness for practice-based IPE. J Interprof Care. 2023;37(1):150–5. https://doi.org/10.1080/13561820.2022.2038551

37. Li JTS, Chau JPC, Wong SYS, Lau ASN, Chan WCH, Yip PPS, et al. Interprofessional education—situations of a university in Hong Kong and major hurdles to teachers and students. Front Educ. 2022;7:653738. https://doi.org/10.3389/feduc.2022.653738

38. Bauer HH. Barriers against interdisciplinarity: implications for studies of science, technology, and society (STS). Sci Technol Hum Values. 1990;15(1):105–19. https://doi.org/10.1177/016224399001500110

39. Welie JVM. Interdisciplinary challenges to inter professional practice In: Ćurković M, Borovečki A, editors. The bridge between bioethics and medical practice: medical professionalism. Cham: Springer; 2022. p. 289–314. https://doi.org/10.1007/978-3-031-09733-1_12

40. Craddock D, O'Halloran C, McPherson K, Hean S, Hammick M. A top-down approach impedes the use of theory? Interprofessional educational leaders' approaches to curriculum development and the use of learning theory. J Interprof Care. 2013;27(1):65–72. https://doi.org/10.3109/13561820.2012.736888

41. Lewitt M, Cross A, Sheward L, Beirne P. Interprofessional education to support collaborative practice: an interdisciplinary approach. London: Society for Research into Higher Education; 2015.

42. Anderson L, Hean S, O'Halloran C, Pitt R, Hammick M. Faculty development for interprofessional education and practice. In: Steinert Y, editor. Faculty development in the health professions. innovation and change in professional education. vol 11. Dordrecht: Springer; 2014. p. 287–310. https://doi.org/10.1007/978-94-007-7612-8_14

43. Hall LW, Zierler BK. Interprofessional education and practice guide no. 1: developing faculty to effectively facilitate interprofessional education. J Interprof Care. 2015;29(1):3–7. https://doi.org/10.3109/13561820.2014.937483

44. Schilling S, Armaou M, Morrison Z, Carding P, Bricknell M, Connelly V. Understanding teamwork in rapidly deployed interprofessional teams in intensive and acute care: a systematic review of reviews. PLoS ONE. 2022;17(8):e0272942. https://doi.org/10.1371/journal.pone.0272942

45. Girard MA. Interprofessional education and collaborative practice policies and law: an international review and reflective questions. Hum Resour Health. 2021;19(1):9. https://doi.org/10.1186/s12960-020-00549-w