



Research Article

Exploring interprofessional learning in musculoskeletal anatomy: Insights from physiotherapy and podiatry students

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In the dynamic field of healthcare education, the paradigm shift towards interprofessional learning [IPL] marks a significant departure, placing emphasis on collaborative learning among students with diverse academic and professional backgrounds. This transformative approach gains prominence in the context of musculoskeletal [MSK] anatomy education, a pivotal area that provides indispensable knowledge to students across varied clinical disciplines. Leveraging problem/gap/hook heuristic, our research primarily investigates the challenges and advantages associated with IPL in MSK anatomy education, with a specific focus on physiotherapy and podiatry students learning experiences. Highlighting the intrinsic value of IPL, the study emphasises its key role in developing essential skills such as teamwork, collaboration, and clinical problem-solving. Acting as a catalyst, IPL not only cultivates heightened confidence among students but also nurtures a collaborative culture that significantly contributes to the improvement of patient care outcomes. By exploring these unique perspectives of physiotherapy and podiatry students' learning experience in a widening participation [WP] environment, our research enriches the understanding of the dynamics that shape IPL experiences, offering insights into the complexities of collaborative learning in anatomy education. Revealing a concealed disparity in the approaches to learning and doing within anatomical education, our study identifies a distinctive challenge for IPL. Bridging the gap between learners and learning content demands careful planning, extending beyond addressing logistical and social challenges. The study underscores the necessity for deliberate course design in shaping content, managing group dynamics, and outlining expected learning outcomes. Critical to the success of IPL is an understanding of students' needs, coupled with the creation of an environment that not only encourages challenges but also provides clear pathways to success. This empowering approach allows students to take responsibility for their anatomy studies, a particularly pertinent consideration within the WP context. This work contributes to knowledge by highlighting the importance of learning from students, advocating for a collaborative approach in co-creating the learning experience. Prioritising student voice in the design and development of IPL becomes instrumental, promoting an environment of collaboration over coercion, thereby contributing to the ongoing discourse on effective healthcare education.

Keywords: Anatomy education, interprofessional learning, widening participation

1. Introduction

The integration of interprofessional learning [IPL] into higher education [HE] signifies a transformative paradigm shift, fostering collaborative learning among students from diverse professional backgrounds. This study explores Lingard's (2015) problem/gap/hook heuristic and examines the complexities of IPL within an HE widening participation [WP] context. It addresses logistical and social challenges, hierarchical structures within allied healthcare, and the specialised demands of musculoskeletal [MSK] anatomy education for physiotherapy and podiatry students. Furthermore, it connects these challenges to the collaborative nature of allied healthcare learning, accentuating the significance of student partnerships in navigating the intricacies of IPL.

2. Understanding IPL Education

The collaborative nature of IPL presents a significant advantage for WP students. By design, IPL integrates students from various disciplines and backgrounds, developing teamwork, communication skills, and a broader understanding of healthcare perspectives (Mitchell et al., 2011). This directly aligns with the core principles of WP education, which strives to provide equal educational opportunities for all students. Pedagogical approaches like case-based learning scenarios (McLean, 2016) exemplify this collaborative strength. Students with diverse knowledge and experiences work together to solve problems, creating an inclusive environment where WP students, who may have limited prior exposure to healthcare settings, can benefit from the expertise of their peers (Perkins, 1999).

2.1. The WP UK Environment

Although higher education experiences are considered to transform lives and improve society by developing engaged citizens who make a valuable contribution to a nation's wellbeing, Chowdry et al., (2013) explains that the unequal access to higher education for students from diverse educational backgrounds is a primary inhibitor. Expanding this drive to increase recruitment from local populations meant that previously marginalised and excluded populations had gained access to a university degree, but support for overcoming obstacles, including a sense of belonging and a sense that academic success was achievable, lagged (Brabon, 2017). Students' connectedness to learning and their identity of 'being a student' has the potential to impact their commitment to studying and development as learners (Scanlon et al., 2007). Within post-1992 institutions with a WP and access agenda, musculoskeletal [MSK] anatomy is commonly taught with students from diverse backgrounds. This means that mixed learning abilities and interprofessional identities often create barriers to learning. This presents a challenge for anatomy educators whereby they need to carefully and responsibly design and embed IPL that serves to promote professionalism, collaboration and inclusion (Lapkin et al., 2011).

Whilst there are many challenges with effectively establishing IPL anatomical learning environments, there are equally opportunities for diversity in learning as noted by Mitchell et al. (2011), who purport that interdisciplinary learning provides invaluable insight into real world problems and issues. This renewed focus on authentic learning is one of the key aims of modern clinical education and graduate outcomes. Despite its merits, IPL implementation in WP contexts presents distinct logistical hurdles. Scheduling conflicts and ensuring equitable access to learning materials for students with varied educational backgrounds are major concerns (Barnsteiner et al., 2007; Clark, 2018). Effective student participation hinges on educators overcoming these challenges. Flexible scheduling strategies and differentiated instruction, which tailors learning materials to accommodate diverse knowledge levels, are essential to ensure all students can meaningfully engage in IPL activities. Social challenges pose another obstacle to successful IPL implementation within WP contexts. Variations in knowledge levels and ingrained hierarchical structures in medicine can create a breeding ground for stereotyping and hinder collaboration (Díaz-Mancha et al., 2016; Leaviss, 2000; Morison et al., 2010). WP students, with their wider range of educational experiences, may be even more susceptible to feeling undervalued or intimidated in such settings. For instance, a medical student accustomed to a traditional, top-down learning environment may be hesitant to contribute alongside physiotherapy or podiatry students who possess specific expertise in certain areas of MSK anatomy (Mitchell et al., 2011; Shields et al., 2015).

The hierarchical nature of healthcare presents a specific social challenge within WP-focused IPL. Healthcare students accustomed to a culture where senior students or faculty take the lead may be resistant to collaborative learning approaches (Morison et al., 2010). This hierarchical influence can be particularly detrimental to WP students, who may already feel less confident due to their wider range of educational backgrounds. Careful consideration needs to be given to strategies that

mitigate the impact of this ingrained hierarchy and promote a more collaborative learning environment.

2.2. Musculoskeletal Anatomy Education for Allied Healthcare Professions

Physiotherapy and podiatry students, with their distinct demands in MSK anatomy education, can make IPL complex. The literature, as highlighted by Mitchell et al. (2011) and Shields et al. (2015), acknowledges a noticeable gap in exploring the experiences of these allied health professions in IPL settings. Mitchell et al. (2011) emphasise the specificity and depth of expertise required in musculoskeletal anatomy for physiotherapy students. Shields et al. (2015) investigate the challenges faced by podiatry students, particularly in navigating the intricacies of lower extremity anatomy. Lingard's (2015) heuristic promotes an exploration of how these challenges manifest in a WP setting, where students may have diverse educational experiences.

Specific pedagogic strategies such as case-based learning scenarios (McLean, 2016), simulation exercises, and collaborative projects need to be designed to accommodate the unique demands of these professions. In the context of IPL, student partnerships offer insights into the lived experiences of diverse learners, informing the development of effective strategies to address logistical, social, and hierarchical challenges. IPL creates a collaborative learning environment that promotes teamwork, effective communication, and a deeper understanding of various professional perspectives (Al-Qahtani & Guraya, 2016). This collaborative approach fosters a sense of shared responsibility and enhances problem-solving skills among students. IPL provides a unique platform for students to share diverse perspectives and insights, enriching their overall understanding of complex anatomical structures (Mitchell et al., 2011; Shields et al., 2015).

Peer and near-peer teaching, integral components of IPL, have been positively reviewed by both learners and educators. These approaches encourage mutual support, creating a dynamic learning environment where students actively engage with and teach each other (Hall et al., 2018; Rodrigues et al., 2009; Youdas et al., 2008). The collaborative nature of IPL has been linked to improved clinical problem-solving skills and heightened professionalism, ultimately contributing to enhanced patient care (Reeves et al., 2010; Sytsma et al., 2015). The World Health Organization [WHO] (2010) make explicit the value of IPL environments in deconstructing professional silos and improving inter/multidisciplinary collaboration in healthcare settings.

3. The Aim

This study aims to explore the unique challenges and benefits faced by physiotherapy and podiatry students in IPL environments, with a specific focus on MSK anatomy education. The study further aims to contribute to knowledge by sharing insights that inform educational practices and enhance the quality of IPL for these allied health professionals.

4. Methodology

A qualitative approach, specifically phenomenology (Pringle et al., 2011), aligned with the study's aim to understand students' experiences and the meaning they attributed to studying anatomy. This method was best suited to explore the depth and complexity of participants' narratives, focusing on individual perceptions and the contextual nuances of their learning experiences, and move beyond surface-level observations.

4.1. Research Design and Data Collection

Ethical approval was granted by the University Ethics Committee. Four semi-structured focus group interviews were conducted with students from the second-year cohorts of podiatry and physiotherapy programmes (Table 1). Focus groups were chosen as the primary method to leverage dynamic interaction and in-depth discussions around participants' experiences with anatomy learning through open-ended questions. This collaborative environment fostered elaboration on individual perspectives to uncover new aspects of the topic.

4.2. Sampling and Recruitment

Purposive sampling was used to recruit participants with firsthand experience studying anatomy in higher education, ensuring their perspectives aligned with the research question. Sample sizes were kept small to gain deeper insights into anatomy learning within the combined program setting see table 1 below. Students who had completed their first year of anatomy (level 4) were invited via email to participate in the focus groups.

Table 1

Focus group composition.

<i>Group</i>	<i>Composition</i>	<i>Number of students</i>
1	Podiatry students	4
2	Physiotherapy students	5
3	Mixture of podiatry and physiotherapy students	5
4	Mixture of podiatry and physiotherapy students	4

4.3. Data Collection

The focus groups lasted 45 minutes, encompassing introductions, main discussions, and summaries. A list of core interview questions served as a guide to facilitate deeper exploration and analysis. These questions included:

- Q1) How do you engage in learning anatomy?
- Q2) What challenges have you faced in learning anatomy at the University?
- Q3) How do you utilize available resources to learn anatomy?
- Q4) What assessment methods do you find most helpful?

One primary investigator conducted the interviews, while another researcher observed and documented non-verbal and verbal communication through field notes. Interviews were transcribed to ensure accurate representation of participant responses.

To enhance transcription reliability, a dual-method approach was adopted. Firstly, interviews were recorded using Microsoft Teams with its transcription functionality enabled. Additionally, a handheld recorder captured a backup audio file. Transcripts were generated through a combination of automated transcription by Teams and manual verification by a skilled transcriptionist. This verification process ensured nuanced expressions, tone, and context were captured, which automated tools might miss. Both methods contributed to a comprehensive and high-fidelity transcription dataset.

Maintaining confidentiality was paramount. All transcripts were anonymised by assigning unique identifiers to participants, replacing personal details with participant codes. This ensured de-identified content while preserving the integrity of responses. Transparency in the transcription process is crucial for establishing the study's credibility. The combined use of digital transcription technology, manual verification, and anonymisation procedures guaranteed a rigorous and accurate representation of the interview data (Lancaster, 2017).

4.4. Data Analysis and Interpretation

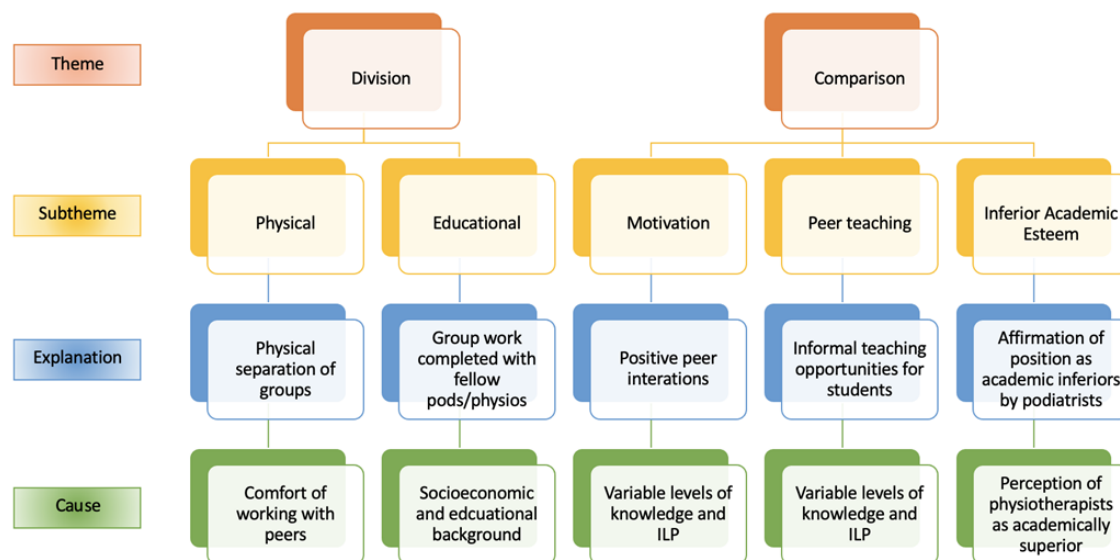
Following each interview, the investigator and observer debriefed to ensure data accuracy. Transcripts were member-checked, reread independently by two researchers, and then collaboratively reviewed to gain a holistic understanding. Thematic analysis, guided by Braun and Clarke (2021), was employed. Transcripts were manually coded and categorised, corroborated with analysis using NVivo 14 software. Triangulation of the analysis process, achieved by combining manual and software-supported coding, strengthened the research's rigour and robustness. Active researcher involvement in coding and theme development minimised potential bias.

5. Findings

Through the thematic analysis two overarching themes, 'division' and 'comparison,' were evident in the IPL experiences of these students (see Figure 1).

Figure 1

Emergent themes through the process of coding and categorisation



5.1. Divisions and Comparisons in Interprofessional Learning

5.1.1. Divisions

In exploring the student experiences within an IPL context, two central themes emerged: divisions and comparisons. These themes highlight both the structural and relational barriers that exist between physiotherapy and podiatry students, as well as the ways these students navigate and respond to their perceived differences. The divisions refer to the physical and educational separations between the two groups, while comparisons focus on how students evaluate themselves in relation to their peers. Both themes are integral to understanding the complexities of IPL in this context and have important implications for improving interprofessional education.

The division theme was characterised by both physical and educational separations between the physiotherapy and podiatry cohorts. Students observed that the physical arrangement of classrooms often reinforced these separations, with physiotherapy and podiatry students seated on opposite sides of the room. Such spatial divisions, although seemingly trivial, reflected a deeper divide in how students from different disciplines were integrated within the learning environment. The lack of interaction between the two groups within the classroom, noted by students, highlighted a missed opportunity for interdisciplinary collaboration and engagement in shared learning spaces.

Beyond the physical layout, the educational divide between the two groups was equally pronounced. Many podiatry students expressed a sense of intellectual disparity, believing that their physiotherapy counterparts had more advanced knowledge. This perception was particularly evident in discussions about anatomy, where podiatry students often felt that physiotherapy students were more academically prepared and capable. One podiatry student articulated, "I think for the pods we felt more intimidated because the physios were a lot more advanced." These feelings of intellectual inferiority were compounded by differences in educational backgrounds

and learning pathways, contributing to the notion that podiatry students were less qualified or capable.

Moreover, socio-economic factors played a significant role in exacerbating these divisions. Mature podiatry students, in particular, highlighted the challenges they faced in balancing academic responsibilities with family commitments. For instance, childcare responsibilities often prevented these students from engaging in group study sessions or dedicating additional time to learning outside of class hours. As one mature podiatry student explained, "I find it challenging to balance family responsibilities with study and feel I am being judged for not engaging." These social and economic barriers further deepened the divide between the two groups, making it more difficult for podiatry students to fully participate in the shared learning environment.

These divisions underscore the importance of addressing both physical and educational barriers in IPL settings. If these divisions are left unaddressed, they will continue to limit the potential for effective interprofessional collaboration and learning. This insight connects directly to the broader discussion about how educators can better facilitate integrative learning experiences that bridge such gaps.

5.1.2. Comparisons

In contrast to the structural and socio-economic divisions, the comparison theme explored the ways in which physiotherapy and podiatry students engaged in comparative self-assessment in relation to their peers. This theme revealed both motivating and distressing elements of how students evaluated their academic abilities and perceived their place in the learning hierarchy. The sub-themes of **motivation**, **peer-teaching**, and **perceived inferior academic ability** all shed light on the complex dynamics of comparison within IPL.

Motivation emerged as a significant factor in driving students to engage more deeply with their studies. The recognition that physiotherapy students had a greater depth of anatomical knowledge often served as a catalyst for podiatry students to seek further understanding. For many podiatry students, working alongside physiotherapy peers provided an opportunity to enhance their learning. One mature podiatry student reflected, "We went to them (physios) after, I think I learnt so much more from them like on a one-to-one level than I actually learnt from the lectures." This exchange highlighted the role of near-peer learning, with students actively seeking out their physiotherapy counterparts for additional guidance. Another student noted, "I personally like the fact that it was with physios... the fact that other people knew a lot, that pushes me like 'oh I don't know that, so I need to go and learn that.'" These exchanges were integral in creating a more dynamic learning environment, where motivation was fostered by the opportunity to compare one's knowledge with that of a peer.

Alongside motivation, **peer-teaching** played a significant role in how students navigated their differences. The IPL context naturally encouraged collaborative learning, with both physiotherapy and podiatry students benefiting from informal teaching exchanges. Physiotherapy students often took on informal teaching roles, explaining concepts to podiatry peers and reinforcing their own understanding in the process. This reciprocal relationship, based on peer support, was essential for creating a comfortable and supportive learning environment. One physiotherapy student observed, "You talked about talking to each other, supporting each other, working in groups... as physios it's almost like there's a common language that you understand." The importance of these peer interactions for reinforcing learning cannot be overstated, as they provided a sense of community within the classroom. However, the imbalance in academic levels often meant that podiatry students felt sidelined in these exchanges, further exacerbating their sense of academic inadequacy.

The most significant issue raised under the **perceived inferior academic ability** sub-theme was the overwhelming sense of self-doubt experienced by podiatry students. Many felt intimidated by the speed and depth of the teaching, particularly when comparing themselves to physiotherapy students who were perceived to be more advanced. This sense of academic inferiority created a

barrier to effective participation in group work and IPL activities. One podiatry student shared, “I think for the pods we felt more intimidated because the physios were a lot more advanced.” The sense of academic exclusion was also compounded by what students perceived as favouritism towards the physiotherapy cohort, with some podiatry students feeling that lecturers were more attentive to physiotherapy students. This imbalance led some podiatry students to withdraw during group activities, as they feared being judged or unable to keep pace. As one student explained, “I found it an issue that we were put with the physios... we go into the lesson and you know one of the lecturers would be saying something in regards to anatomy, they knew it straight away and knew everything and then the podiatrists were left in the corner, not knowing what’s really going on.” These perceptions of academic inequality and exclusion further hindered the potential for effective IPL.

The theme of **comparison**, while demonstrating how students sought motivation through peer interactions, also revealed the emotional and intellectual challenges of engaging in an environment where students feel judged or inferior.

6. Discussion

The findings of this study highlight the complex challenges and opportunities inherent in implementing Interprofessional Learning within Musculoskeletal anatomy education, particularly within a widening participation context. These challenges, notably those arising from physical, educational, and socio-economic divisions, provide important insights for educators aiming to create more inclusive IPL environments. As identified by Chowdry et al. (2013), students from WP backgrounds often face significant barriers in higher education, particularly in terms of access to resources and support. The findings of this study resonate with these concerns, illustrating how disparities in academic preparation, perceived intellectual abilities, and socio-economic backgrounds contribute to the division observed between physiotherapy and podiatry students in the classroom.

The division theme identified in the study underscores the need for educators to be cognizant of these disparities and actively work to bridge gaps, both physically and intellectually. The physical separation of students, as described by participants, mirrors the social and academic divides that can hinder effective IPL. This finding aligns with the work of Lapkin et al. (2011), who argue that physical and intellectual separations between disciplines can stifle the potential benefits of IPL, making it crucial for educators to foster more integrated and collaborative learning environments. In the context of WP students, overcoming these divisions becomes even more pressing, as students from diverse educational backgrounds may already feel marginalized or underprepared (Brabon, 2017; Scanlon et al., 2007).

Furthermore, the study draws attention to the dual nature of comparison, as highlighted by the comparison theme. Students in both disciplines—physiotherapy and podiatry—reported feelings of intellectual inferiority, particularly in relation to perceived differences in academic preparedness. This finding speaks directly to the literature on social dynamics in IPL, particularly the challenges that students face when comparing their abilities to those of their peers (Leaviss, 2000; Morison et al., 2010). On one hand, comparison can serve as a motivating force, driving students to strive for excellence and learn from one another. On the other hand, the negative emotional impact of such comparisons, particularly for students from WP backgrounds, can undermine confidence and hinder effective participation in IPL activities. The study's emphasis on the need to manage comparison within the classroom aligns with Díaz-Mancha et al. (2016), who emphasize the importance of addressing social challenges in IPL settings to ensure that all students feel valued and capable of contributing.

The role of peer teaching and collaboration, identified as a positive outcome in this study, offers a promising solution to some of these challenges. Peer learning, a key aspect of IPL, has been widely recognized as a valuable pedagogical tool in both healthcare education and beyond (Rodrigues et al., 2009; Youdas et al., 2008). The findings of this study underscore how students, through peer teaching, can support one another, thus alleviating feelings of inferiority and

fostering a more collaborative and supportive learning environment. This aligns with Mitchell et al. (2011), who argue that interprofessional collaboration in IPL settings not only enhances academic understanding but also develops essential professional skills such as communication, teamwork, and problem-solving.

The study also highlights the importance of addressing socio-economic barriers within the WP context. As noted in the literature, students from WP backgrounds often face unique challenges in accessing resources, navigating institutional structures, and adjusting to academic expectations (Chowdry et al., 2013). The findings of this study reinforce the need for educators to consider these barriers when designing IPL curricula, advocating for the development of tailored interventions such as mentorship programs, flexible scheduling, and differentiated instruction. These strategies, as outlined in the work of Clark (2018) and Barnsteiner et al. (2007), can help level the playing field, allowing all students, regardless of their background, to participate meaningfully in IPL activities. The role of mentorship, in particular, is highlighted in this study as a critical element in supporting WP students as they navigate both the academic and social dimensions of IPL.

Additionally, the hierarchical dynamics in healthcare education, which often shape interprofessional interactions, emerge as a key concern. This study confirms the observations made by Morison et al. (2010) and Leaviss (2000), who note that hierarchical structures in healthcare settings can undermine collaboration and hinder the development of equal partnerships between students from different disciplines. In the context of MSK anatomy, where physiotherapy and podiatry students possess distinct expertise, the hierarchical nature of healthcare education can exacerbate feelings of inferiority, particularly for WP students. By recognizing and addressing these challenges, educators can create more equitable and collaborative IPL environments. This requires actively dismantling hierarchical barriers and promoting an ethos of mutual respect and shared responsibility (Díaz-Mancha et al., 2016).

7. Conclusion

This paper has purposefully considered how connecting different MSK anatomy learners and learning experiences impact professional and academic outcomes. The WP context provides a useful lens to examine the value of combining differences within learners, with an attempt to provide an integrated IPL environment for MSK anatomy. The paper considered two professional health groups and how students within these groups understand, value and describe their learning experiences. Whilst the focus on two interprofessional groups was insightful, we acknowledge that there may be limitations in applying the findings across different learning groups and IPL environments. Recognising the challenge, yet opportunities that belie IPL, we need to consider **not what lies between us**, but rather **what lies in front of us**.

As educators in anatomy this process of inquiry has enabled us to reflect on our own practice, our pre-theoretical assumptions, biases and thoughts about how students from diverse backgrounds work as a team in a learning environment. It is incumbent upon us to remove these barriers in our teaching practice through constant self-reflection and critiquing assumptions about how students learn. This will foster a positive IPL learning environment in a widening participation HE institution, empower students, improve health education and ultimately provide better patient care outcomes. This study has therefore advocated for a commitment to ongoing research and the implementation of evidence-based practices to refine IPL approaches. Educators have a professional responsibility to continuously improve teaching practices based on research findings. By acknowledging the challenges identified in this study and actively seeking solutions through future research endeavours, educators can ensure that IPL environments are inclusive and beneficial for all students.

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