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Integrating neuroscience and social psychology in researching interprofessional education: the INSPIRE framework

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ABSTRACT

There is an increasing focus on the importance of interprofessional education as an integral part of health and social care training. However, the fundamental psychological processes underlying successful interprofessional education are not well understood. Here we propose a single framework, Integrating Neuroscience and Social Psychology In Researching Interprofessional Education (INSPIRE), grounded in evidence from social psychology and neuroscience that could be used to generate testable hypotheses to inform the design, development and evaluation of interprofessional education. The application of this framework offers a novel, scientifically grounded approach to improving the learning outcomes of interprofessional education and provides a foundation for future research in this field.

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Introduction

Interprofessional education (IPE), when students of "two or more professions learn with, from and about each other to improve collaboration and the quality of care" (Centre for the Advancement of Interprofessional Education, 2002) is recommended in health and social care programs to prepare students for collaborative practice (e.g., Bogossian et al., 2023; Delawala et al., 2023; World Health Organisation, 2010). Effective interprofessional collaboration is increasingly recognized as critical for addressing the global workforce challenges (World Health Organisation, 2010; 2022) through improving communication, psychological safety, staff wellbeing and retention, and patient outcomes (e.g., Burt et al., 2024; Dietl et al., 2023; World Health Organisation, 2010).

A number of theoretical perspectives have informed the design, delivery, or evaluation of IPE interventions (see Barr, 2013; Hean et al., 2018; O'Leary & Boland, 2020). However, to our knowledge, no single, comprehensive theoretical framework currently explains what and how students learn during these sessions, nor how learning shapes future learning and interaction. This lack of a unifying framework limits the development of targeted hypotheses, intervention design, and comparable evaluation across studies (Kong et al., 2025; see also Aldriwesh et al., 2022; Spaulding et al., 2021). Advancing the field of IPE, therefore, requires robust theory that accounts for the complex interplay of individual, interpersonal, and systemic factors in IPE (Xyrichis, 2025).

The **I**ntegrating **N**euroscience and **S**ocial **P**sychology **I**n **R**esearching Interprofessional **E**ducation (INSPIRE) framework focuses on what students learn during IPE including not only topic-related knowledge but also learning about themselves, other professions, and collaborative dynamics. The framework is based in predictive processing theory (e.g., Friston, 2005), which conceptualizes learning as a dynamic process in which prior knowledge generates implicit predictions that guide attention and interpretation, and are updated through experience. This cycle of prediction, attention, and learning is dynamic, such that events in a session can reshape future learning by modifying predictions and attention within subsequent sessions.

Within predictive processing accounts, predictions operate primarily at an implicit (unconscious) level. Although learners may form explicit expectations, INSPIRE focuses on implicit predictions, as these are most strongly supported by evidence and most directly shape attention and learning. Accordingly, "prediction" hereafter refers to implicit predictions.

The INSPIRE framework

To explain the processes involved in IPE, the INSPIRE framework integrates theory and evidence from the Contact Hypothesis (social psychology), and predictive processing accounts for perception and action (social and cognitive neuroscience). The Contact Hypothesis proposes that prejudice can be reduced through appropriate contact between individuals from different groups; outcomes include improved attitudes toward outgroups, particularly when contact occurs under suitable conditions (Allport, 1954). This framework has been widely applied within IPE to explain how bringing professional groups together improves intergroup relations (Bridges & Tomkowiak, 2010; Hean et al., 2018; Michalec et al., 2017). Although this work has primarily focused on improving attitudes toward other professional groups and

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reducing stereotyping (Carpenter & Dickinson, 2016; Hean & Dickinson, 2005), IPE is also explicitly concerned with learning "with, from and about other professions" (Centre for the Advancement of Interprofessional Education, 2002). Understanding IPE, therefore, requires moving beyond attitudinal outcomes to consider what learners attend to, how information is interpreted, and what is ultimately learned.

Positive intergroup contact is characterized by four facilitating conditions: equal status between groups, positively interdependent goals, cooperative interaction, and support from relevant authorities (Allport, 1954; Pettigrew, 1998). These "contact conditions" map closely onto several well-established educational theories that underpin effective IPE. Social learning theory (Bandura, 1977) and social constructivism (Vygotsky, 1978) emphasize cooperative, equal-status interaction, shared goals, and scaffolded dialogue, which mirror the mechanisms through which interprofessional groups learn *with, from, and about* one another. These links are explicitly highlighted in Hean et al. (2012) theoretical analyses of IPE, which discuss the relevance of social learning, adult learning, and constructivist principles in collaborative curricula. Social capital and social practice theories further reinforce the importance of supportive institutional norms, identity work, and trust-building in interprofessional settings, aligning with Allport's emphasis on authority support and cooperative, norm-guided engagement (Colyer et al., 2005). Beyond the overarching principles of contact, then, Allport's (1954) contact conditions are firmly aligned with established pedagogical principle

There is also empirical support for the role of the contact conditions in educational settings. One of the most influential cooperative learning methods in education – the jigsaw classroom – was developed as a pedagogical application of Allport's hypothesis, utilizing equal status, common goals, structured interdependence, and school norms to improve intergroup relations and learning (Aronson & Bridgeman, 1979). More recently researchers have demonstrated the central role of school norms in positive personal (McKeown et al., 2024), educational (Zysberg & Schwabsky, 2021), and pro-social (McKeown et al., 2025) outcomes. As such, intergroup contact theory has long been used to inform and understand learning environments. However, there is a need to more intentionally and explicitly embed optimal contact conditions in the design, delivery, and evaluation of IPE.

Notwithstanding its utility in IPE, and some progressive understanding of the mechanisms by which contact improves intergroup relations, both contact research and existing IPE research provide limited insight into how learners process information during interprofessional sessions. Contact-based approaches emphasize attitudinal change but do not directly address how perception, attention, and learning are shaped by prior knowledge of the topic, the context, or the professional groups involved. If IPE is genuinely about learning "with, from and about" others, then these cognitive and perceptual processes must also be considered.

Evidence from cognitive neuroscience demonstrates that perception and attention are not passive responses to incoming information (e.g., Clark, 2013; Friston & Kiebel, 2009; Summerfield & Egner, 2009). Instead, the brain actively generates predictions about how events will unfold, biasing what is perceived and attended to (e.g., Bach et al., 2014; Csibra, 2008; Kilner et al., 2007). Perception is, therefore, hypothesis-driven: predicted sensory input is compared with actual input, and mismatches prompt updating of either the prediction or its interpretation (Bubic et al., 2010; den Ouden et al., 2012; Friston & Kiebel, 2009). When predictions are accurate, they efficiently guide processing by filling in missing information (Roelfsema & de Lange, 2016).

Although substantial evidence supports such predictive processing accounts (see Millidge et al., 2022 for a review), recent work suggests these predictive processes are also shaped by *who* else is involved (Bach & Schenke, 2017; Barresi & Moore, 1996; Newen, 2015). Specifically, perception and attention are influenced by implicit, person-specific predictions based on prior experiences with the people involved (Joyce et al., 2016; Schenke et al., 2016, 2020). This is particularly relevant for IPE, where learners often enter sessions with established expectations about other professional groups based on prior training, workplace hierarchies, and past interactions.

The INSPIRE framework applies these predictive mechanisms to IPE contexts. It proposes that learning during IPE – whether about the session content, situational context, individual participants, or professional groups – is shaped by implicit predictions formed from prior knowledge and experience. These predictions guide attention, interpretation, and retention, and are continuously updated as the session unfolds. Learning is, therefore, conceptualized as a dynamic process arising from the interaction between prior expectations and current experience (see Figure 1). To our knowledge, this is the first application of predictive processing principles to IPE, offering a novel framework for understanding both the opportunities and risks inherent in IPE design.

The INSPIRE framework complements existing educational theories by specifying the cognitive mechanisms through which prior knowledge of contextual, social, and instructional factors shapes attention and learning. In doing so, it extends constructivist accounts by grounding these processes in implicit predictive mechanisms that guide interpretation and memory.

The role of pre-session briefings in shaping prior predictions

Because perceptual and attentional processes are shaped by learners' prior expectations, briefing becomes a critical point of leverage within INSPIRE. Here educators can intentionally shape predictions about the content, the roles of different professions, and the purpose of the interprofessional encounter. Without this, students may default to assumptions that narrow their attention or reduce engagement. INSPIRE proposes student learning expectations will influence their attention, interpretation and retention of information. Indeed, students are often hypervigilant toward information believed to be critical for graded assessments, and more dismissive of materials deemed to be less relevant (Middlebrooks et al., 2017). If IPE is framed as an "add-on," or if its purpose is unclear, this may not only undermine motivation but also shape predictions that limit engagement and learning during

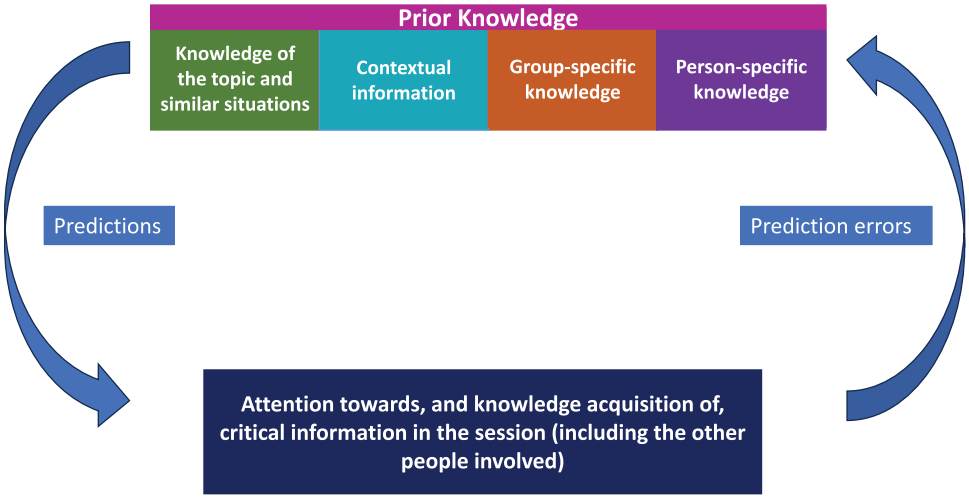

Figure 1. The INSPIRE framework. This framework, informed by predictive processing accounts, illustrates how prior (implicit) predictions – relating to content-specific knowledge, context-specific knowledge, individual person knowledge and professional group-based knowledge – shape attention, learning and memory during IPE sessions.

the session. A clear and structured briefing, therefore, plays a central role in setting expectations that support effective IPE.

In practice, briefings can be delivered either uni-professionally or multi-professionally, depending on the learning design. Uni-professional briefings allow educators to address profession-specific expectations, anxieties, or misconceptions before students enter the interprofessional space. Multi-professional briefings help establish shared goals, clarify the purpose of collaboration, and begin aligning mental models across groups. INSPIRE does not prescribe one format over the other; rather, it highlights that the structure and clarity of the briefing – regardless of format – are essential for shaping the predictive processes that underpin effective interprofessional learning.

Although briefing (and de-briefing) is recommended by several authors (e.g., Barr & Coyle, 2013; Boet et al., 2014; Maddock et al., 2023) we are not aware of any guidelines that specify what this should entail. The INSPIRE framework addresses this gap by identifying specific elements of prior knowledge that can be intentionally shaped before interprofessional contact.

First, briefings should explicitly link new learning to students' existing knowledge and experiences. Learners' predictions for a session are informed by prior encounters with similar topics and formats, and effective learning requires new material to be scaffolded onto this existing knowledge. The briefing should, therefore, clarify assumed prior knowledge, specify learning outcomes, and explicitly articulate what students are expected to learn *with, from, and about* other professions. Although IPE does not aim for students to master each other's curricula, clarity regarding learning goals (e.g., understanding scope of practice or decision-making roles) helps direct attention to relevant information across professional boundaries. INSPIRE predicts that information perceived as more relevant to a learner's goals will be preferentially attended to, learned, and retained.

For each session, learners and educators have their own goals. Some will be aligned (e.g., based on the prior provision within the briefing of learning outcomes), and some will be more personal (e.g., if a learner is unsure about a particular aspect they may have a goal to specifically focus on understanding this better). Overall briefing session goals are likely to fall within the following categories:

–Improve student understanding of how they can work together with other professions to achieve a shared goal
–Improve student understanding of what role another profession takes within a specific context or setting, and how this fits with their own role and responsibilities
–Understand the perspectives of others and their roles and responsibilities and how they complement or contradict one's own
–Build collaborative networks between members of different professions
–Improve relations between members of different professions
–Learn critical new topic-based information

Second, briefings should clearly define the collaborative task and shared goals of the session. In line with Contact Hypothesis principles, emphasizing interdependence and joint problem-solving supports constructive engagement between professional groups (Hean et al., 2018). From an INSPIRE perspective, clearly explaining the purpose and value of the task is expected to enhance attentional engagement, learning, and knowledge retention compared to sessions in which task relevance is left implicit.

Third, briefings should explicitly frame the intergroup context. Learners enter interprofessional sessions with preexisting beliefs and expectations about other professions, which may be inaccurate or shaped by stereotypes. Although educators cannot control these priors directly, they can influence how intergroup contact is structured and interpreted. Briefings should support conditions for good intergroup contact (Allport, 1954; Pettigrew, 1998), including equal status between groups. This is especially important in healthcare contexts where professional hierarchies are salient. Briefings can address this by highlighting the distinct but complementary expertise each

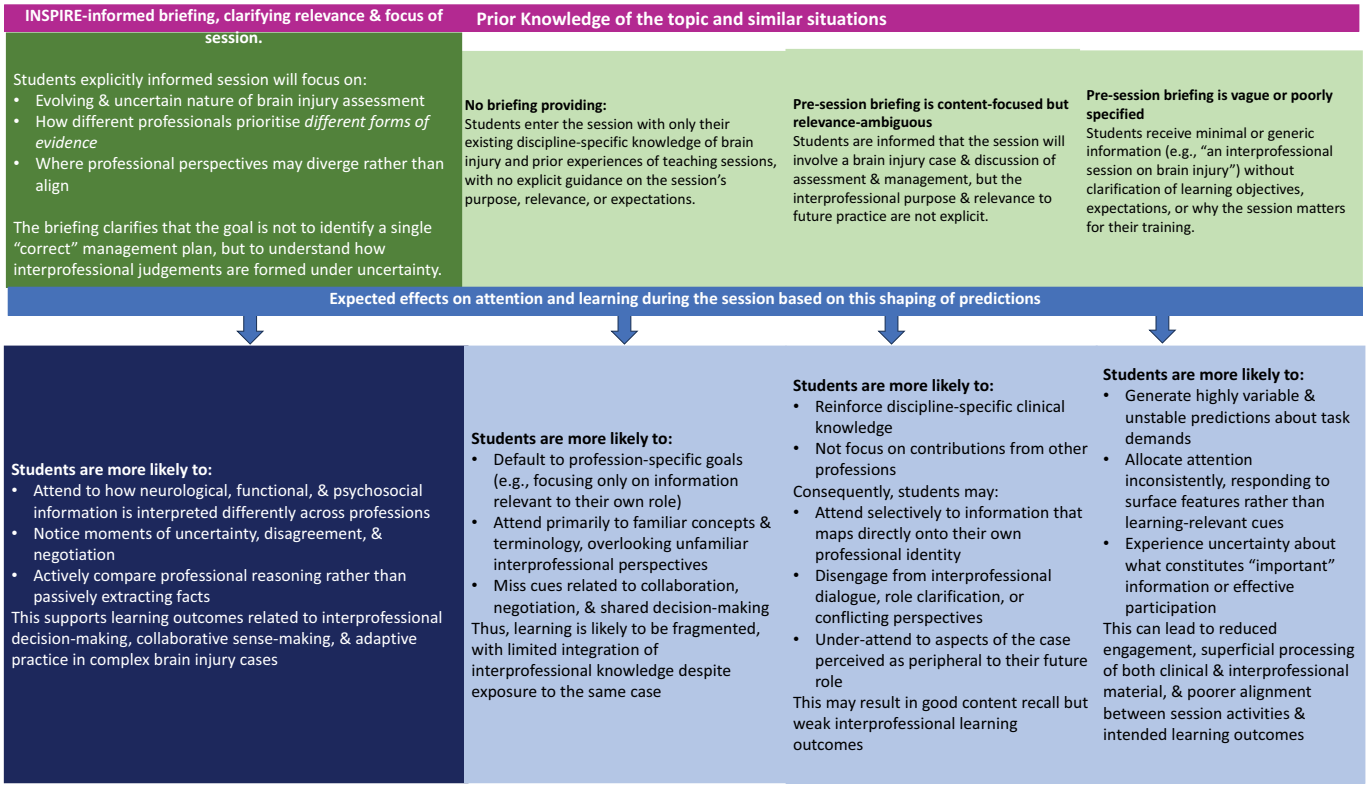

Figure 2. The hypothesized influence of different content-related briefings.

profession brings to the session, reinforcing the value of all contributions to the shared goal without assuming uniform knowledge or experience across groups.

Fourth, briefings should signal institutional and authoritative support for IPE. Explicitly linking sessions to program-level goals, professional practice, and future collaborative work helps establish the legitimacy and importance of IPE. From an INSPIRE perspective, such signals shape contextual predictions that influence engagement, attention, and learning during the session.

An example of INSPIRE-Informed briefing design

Using the example of a case-based session involving nursing, physiotherapy, and clinical psychology students focused on care following acquired brain injury, we illustrate how INSPIRE can inform the design of a pre-session briefing and the hypothesized consequences of different briefing approaches. An INSPIRE-informed briefing deliberately shapes key prior predictions across the four components (Figure 1) by clarifying: (a) the relevance and focus of the session (content-related knowledge); (b) the format, participation expectations, and non-assessed nature of the activity (contextual knowledge); (c) the complementary expertise and equal status of each profession (professional group-based knowledge); and (d) the shared goal of developing a collaborative, patient-centered care plan (intergroup context). Consistent with the framework, shaping these predictions is expected to guide attention and interpretation during the session, increasing engagement with other professions' contributions and supporting collaborative interaction.

Although learners' implicit priors cannot be directly observed, they can be influenced by what is intentionally primed before the session. When learners enter with negative predictions – for example, that the content is irrelevant ("this information is not relevant to me"), the context lacks value ("this will not help my career"), an individual is incompetent ("Sam is not a competent student"), or a professional group is superior ("medical students are superior") -confirmation bias is likely to reinforce these expectations, leading to more negative learning experiences. For example, students are more likely to notice Sam giving one incorrect answer while overlooking multiple correct contributions. This selective attention results in limited learning and more negative evaluations of other individuals/groups. Crucially, the information that is attended to and retained becomes the basis for future predictions, shaping expectations and engagement in subsequent interprofessional encounters.

Content-related prior knowledge

The content-related prior knowledge component concerns students' prior knowledge of the topic area, which guides attention and subsequent learning during the session. Educators need to understand what students have already been taught (including placement activities) to scaffold new learning onto existing knowledge. A pre-session briefing should, therefore, clearly specify key objectives and learning outcomes to shape student predictions, attitudes, engagement, and learning (see Figure 2).

Context-related prior knowledge

The context-related prior knowledge component of the framework concerns students' prior knowledge of the situational, structural, and cultural cues that characterize the learning environment. These contextual cues inform learners' predictions about task demands, social dynamics, and behavioral norms, thereby shaping attentional allocation, interpretation of interprofessional interactions, and subsequent learning outcomes.

Contextual information includes expectations associated with the educational setting and format (e.g., classroom, simulation, or clinical placement; online or in-person delivery; lecture, workshop, case-based discussion, or simulation). These cues generate predictions regarding expected engagement, the degree of active participation required, and whether errors are experienced as safe learning opportunities or as consequential.

Contextual priors also shape predictions about the framing and goals of the session (e.g., learning-focused versus performance-focused), which influences what information is attended to, the professional perspectives that are prioritized, and whether unexpected interprofessional contributions are treated as informative prediction errors or discounted. Therefore, the pre-session briefing should detail the critical contextual information of the session to shape student predictions and subsequent attitudes, engagement and learning (see Figure 3).

Person-related prior knowledge (at the individual and group level)

The defining feature of IPE compared to other educational sessions is the impact of *who* else is involved (both in terms of the other individuals and professional groups). Therefore, the INSPIRE framework proposes that the individuals involved in IPE – both in terms of their personal and professional characteristics – will influence what content is attended to, how it is interpreted, and what is subsequently retained. Importantly, this person-knowledge also influences attitudes that will be brought into the session and how they may affect attitudes during and after the session. There are four potential outcomes that may emerge when testing the central hypothesis that *who* is involved will influence what is attended to, used and retained from the sessions:

(1) There is no influence of attention to information and, therefore, no effect on learning outcomes, based on the other individuals or groups involved.
(2) Although attention to information may be influenced, learning outcomes may not differ significantly when other individuals or groups are present compared to when they are not (here, such attentional influences could be extremely short-lived such that whilst our attention may initially be influenced, this influence is not long enough to exert an influence on our knowledge acquisition).
(3) If our attention is drawn to certain material by another participant, we may fail to learn other material to which our attention was not drawn (i.e., a standard facilitation priming effect as typically seen within attentional and perceptual research, Tulving & Schacter, 1990).
(4) We may see that another student profession is attending to a key bit of information and assume that they have "got it" so we focus, instead, on other information. As such, we do not learn the information they are focusing on, and, instead, learn other information.

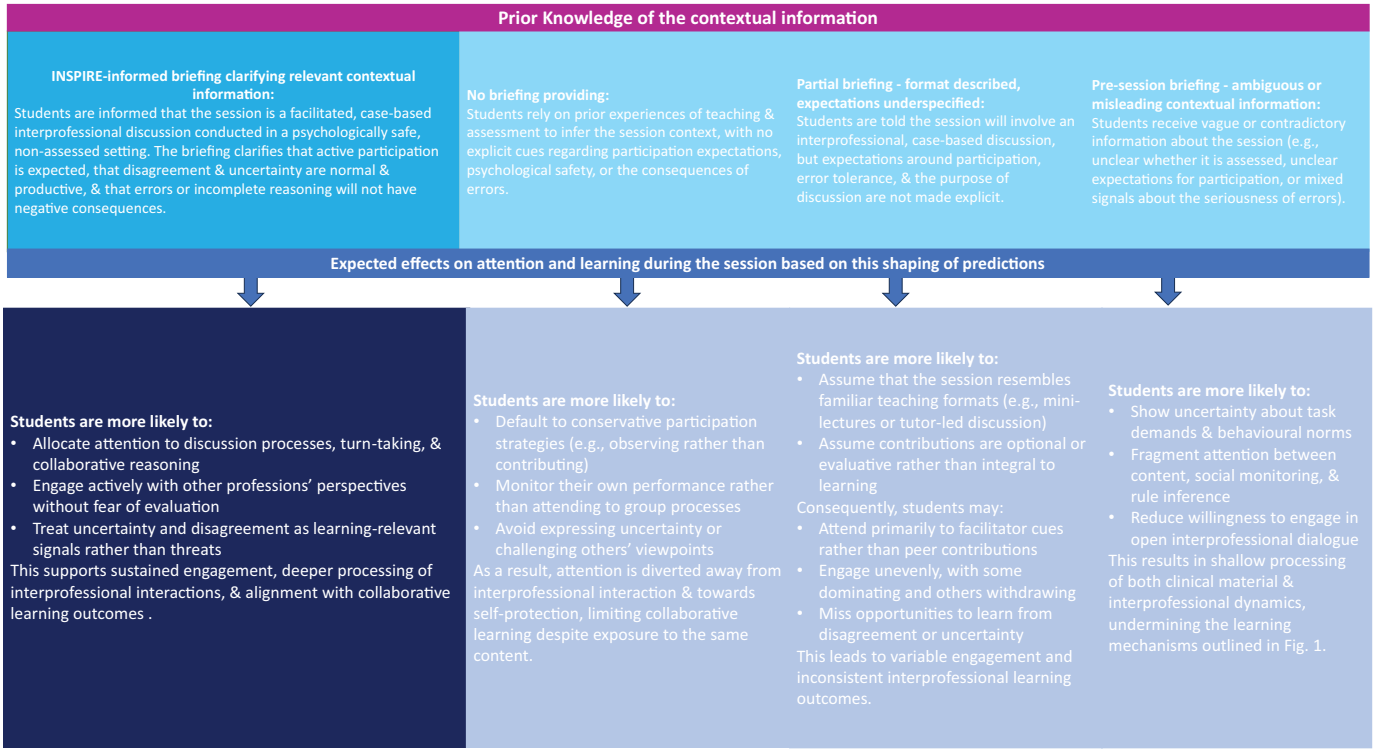

Figure 3. The hypothesized influence of different context-related briefings.

Experimental research is needed to ascertain which of the above is true and in what contexts. For example, one might expect the fourth outcome if working on a joint task with clearly segregated tasks for each professional group to take ownership of, whereas the third outcome would be less useful in such a task.

It is also important to consider the impact of the intergroup context. Although the above hypotheses stem from the cognitive mechanisms described by predictive processing accounts, the INSPIRE framework also incorporates insights from the Contact Hypothesis literature. This literature is particularly relevant to IPE, where learners are not only acquiring new knowledge but also engaging with individuals from different professions. As such, the quality and nature of these intergroup encounters are likely to influence the learning outcomes. Therefore, we propose a set of hypotheses (based around the four conditions for good interpersonal contact, derived from the Contact Hypothesis literature), concerning how the intergroup context may shape what is attended to, internalized and retained during interprofessional sessions:

(1) Prior implicit predictions where all professional groups in the session are seen to be of equal status will foster more positive attitudes toward, and greater collaboration with, other participants compared to where some groups either view themselves, or are viewed, as being of a lower status.
(2) When there is clear support from institutions/people of authority within the initial briefing, attitudes and judgments toward outgroup members will be more positive compared to when such support is unclear or lacking.
(3) When there is a common goal (goal interdependence and cooperative behavior), attitudes and judgments toward outgroup members will be more positive compared to when this is lacking.
(4) When contact is sustained and interactions are meaningful, attitudes and judgments toward outgroup members will be more positive compared to when contact is not sustained, and interactions are not meaningful.
(5) When there is negative interdependence (i.e., a conflicted reward structure) or competitive behavior, judgments will be more negative

As aforementioned, the four conditions for effective intergroup contact are also strongly aligned with established educational theories. These contact conditions can be understood not only as social prerequisites, but as educational affordances that support learning through shared activity and dialogue. From the INSPIRE framework's predictive processing perspective, we argue that when these four conditions are made salient to learners during a pre-session briefing, they will shape the prior implicit predictions brought into the session. In turn, these priors are likely to influence how intergroup cues are interpreted, which affects what is attended to, internalized, and retained during IPE (see Figure 4).

Whilst the intergroup context is clearly important, it is also integral that briefings consider the person-specific knowledge (see Figure 5).

Designing for good contact

The previous section highlighted the INSPIRE framework's key proposal of the importance of the pre-session briefing. However, it is important to note that knowledge about the four key aspects will be updated throughout the session through ongoing interaction and inference, and this will then be used as prior knowledge in the next session. Thus, these aspects need to be considered throughout the session, not just during the briefing. The framework also posits further areas of importance to consider during the design stage.

IPE should not be perceived as an "add-on" but as an important part of professional development. Thus, sessions should be integrated into study programs, with clear learning outcomes and assessment, and with clear support from the institution. That is, there should be a clear narrative across the course regarding the need for, and value of, IPE. Educators need to approach IPE in the same vein as they approach all teaching – considering how each session builds on the previous knowledge base of the students to scaffold their new learning. The novel element with IPE, however, is that the educator also needs to consider how best to build in and facilitate good intergroup contact within their sessions, especially given that one of the key aims of IPE is to foster strong, positive relationships between the different professions to enhance communication and collaboration among them (D'amour & Oandasan, 2005).

The Contact Hypothesis posits that to be good, intergroup contact needs to be sustained and involve meaningful interactions (Pettigrew, 1998). Thus, within IPE it is not enough to simply put different teams together within an educational setting, it needs to be done in a meaningful way, with meaningful joint tasks to provide the right conditions for good contact. Further research is needed to determine how joint tasks can be designed to create optimal conditions for such contact.

The deliberate bringing together of different professional groups makes such settings inherently social and intergroup in nature, where learners are not only acquiring knowledge but also forming impressions of – and interacting with – members of other professions. Thus, it is important to consider the substantial evidence that our attention, information acquisition, attitudes, and judgments of others are shaped by prior knowledge (Srull et al., 1985; Vonk, 1994). Once opinions – and any accompanying personality attributions – form, they tend to remain stable and rarely change even in the face of contradictory evidence (Knobloch-Westerwick et al., 2020; Srull & Wyer, 1989).

Such dynamics are particularly relevant for IPE, where learners may rely on group-based assumptions in the absence of prior experience with members of other professions, potentially reinforcing stereotypes and shaping how intergroup interactions – and the learning that occurs within them – unfold. Although people extract both situational and dispositional information when observing others (e.g., Ham & Vonk, 2003; Schenke et al., 2016; see also Bach & Schenke, 2017; Newen, 2015), situational models are more easily revised than person models. This asymmetry is particularly pronounced in group contexts, where stereotypes are often preserved through rationalization. Behaviors that contradict

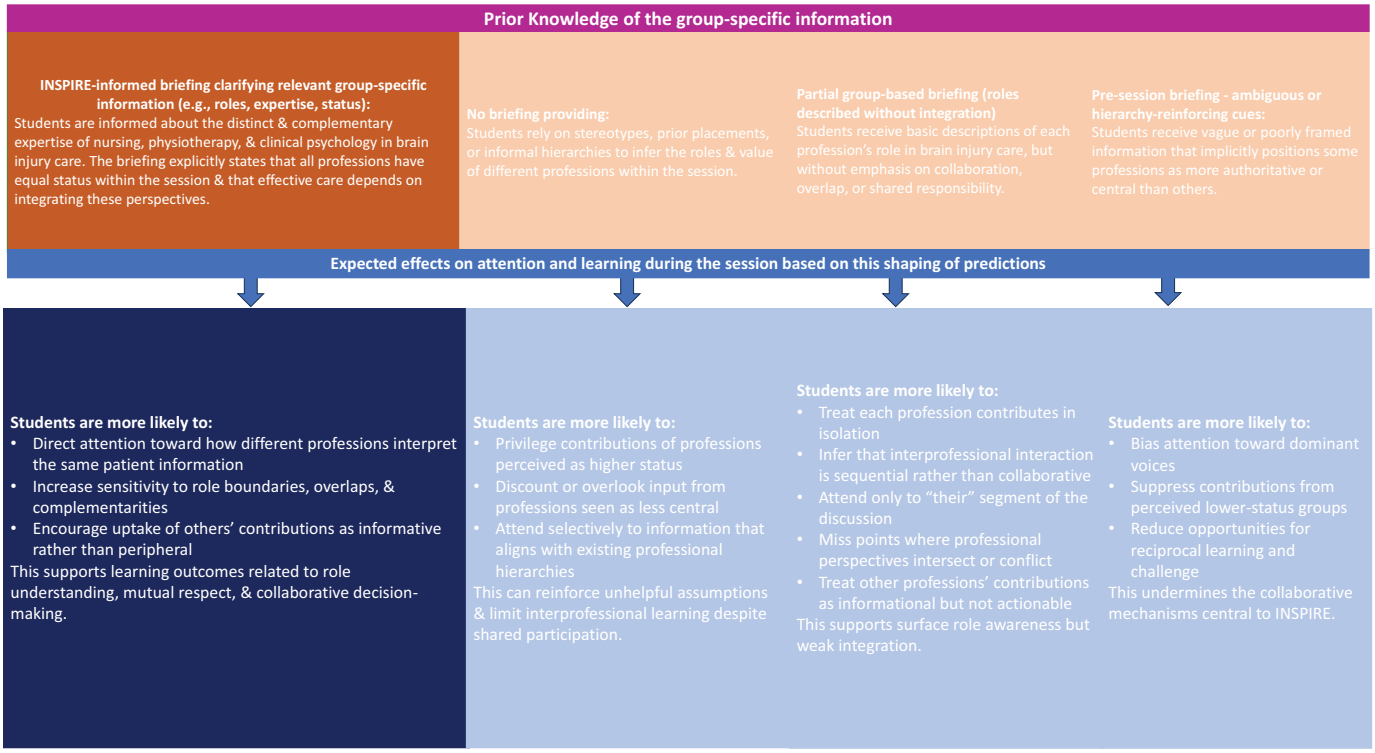

Figure 4. The hypothesized influence of providing different briefings related to the professional groups involved.

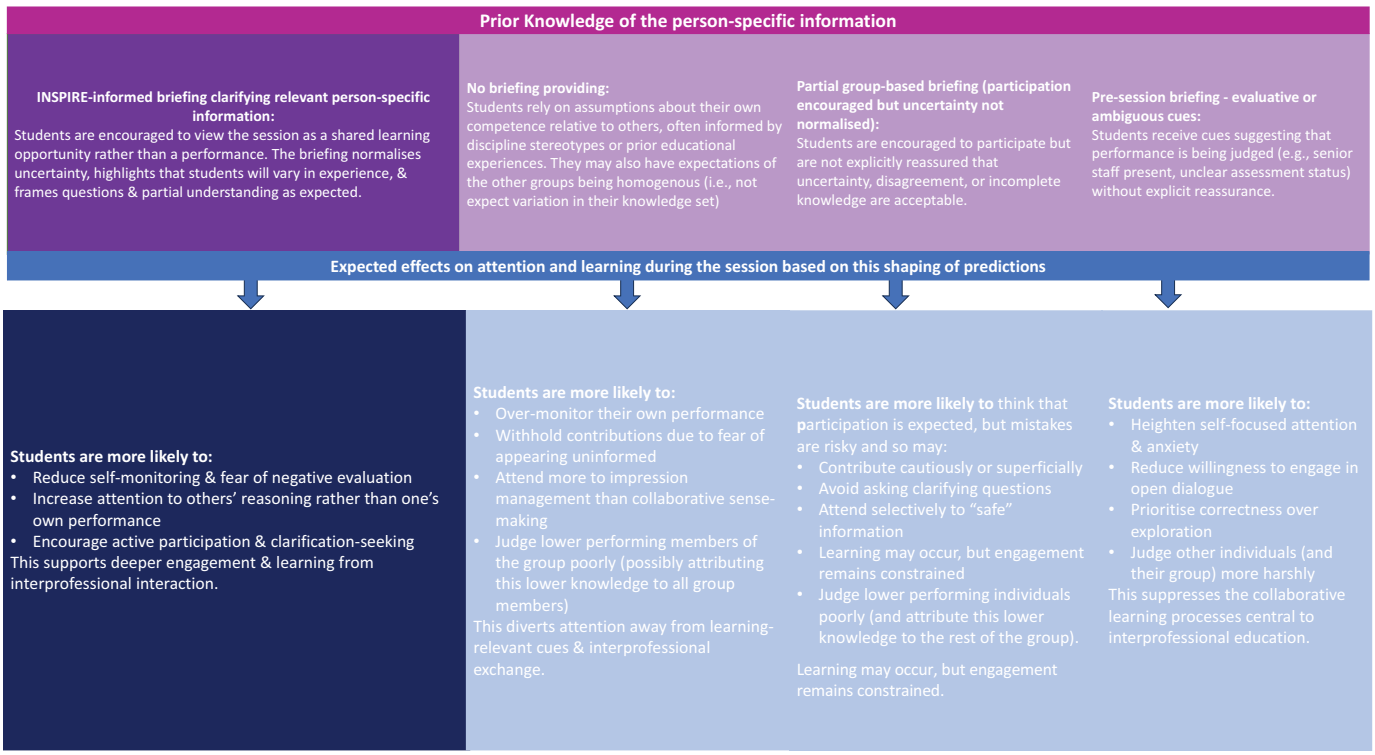

Figure 5. The hypothesized influence of different person-related briefings.

group-based expectations are explained away as situational anomalies or exceptions to the group norm (e.g., that they are unusual compared to others in their group; Sherman et al., 2005), thereby preserving the stereotype. Stereotypes tied to salient group characteristics – such as sex, race, or sexual orientation – are particularly resistant to change (e.g., Pettigrew & Tropp, 2006; Sherman et al., 2005; see; Pettigrew, 1981, for a review).

Within IPE, this resistance to change raises important questions about the malleability of stereotypes surrounding health professions, especially given the likelihood of preexisting hierarchical assumptions. For instance, intergroup contact has

been found to reduce prejudice more among majority group members than among minoritised individuals (Tropp & Pettigrew, 2005), likely due to differences in authority, power, and status. These disparities influence how group members perceive and engage with interprofessional contact (Dovidio et al., 2017), affecting both pre-session attitudes and subsequent learning. Thus, it is important for educators to consider how they discuss the different groups and the language they use. Also, to be aware which hierarchies may exist and consider how to reduce these within the session.

Predictive processing frameworks suggest that impressions are updated only when new, incongruent information is equally diagnostic or when existing mental models are sufficiently flexible to accommodate change. In the absence of such conditions, contradictory behaviors are often rationalized or dismissed to preserve the existing model. However, if incongruent information is both compelling and persistent, and the cognitive cost of maintaining the old model becomes too high, even inflexible models may eventually be revised or jettisoned altogether (e.g., Friston, 2005). Furthermore, models about social groups tend to be particularly resistant to change; the counter-stereotypical behavior of a single or minority group member is often dismissed as being unrepresentative, with such individuals labeled as "outliers" (Richards & Hewstone, 2001; Weber & Crocker, 1983). This dynamic is highly relevant in IPE, where preconceptions influence what individuals attend to and remember. When someone behaves in a way that violates these expectations, it draws greater attention and deeper cognitive processing, enhancing memory for the incongruent behavior (e.g., Quadflieg et al., 2011; Srull & Wyer, 1989; Stangor & McMillan, 1992). As such, expectation-violating behaviors during interprofessional encounters may offer a powerful route to changing impressions provided that such behaviors are perceived as meaningful and representative and not "outliers." Educators must, therefore, understand how expectations are formed and revised – and what happens when individuals behave in ways that contradict stereotypes. Careful group composition, a clear pre-session briefing, and joint tasks aligned with the Contact Hypothesis conditions for good contact are, therefore, essential. By explicitly setting expectations and encouraging meaningful contact, educators may mitigate some of the cognitive biases that maintain stereotypes and impede cross-group understanding. Further empirical research is urgently needed in this area.

Although this deeper processing can be beneficial when interactions are unexpectedly positive, it may reinforce negative stereotypes if the behavior confirms preexisting biases. Understanding this balance is crucial for designing effective IPE. For instance, a student nurse with positive prior experiences of both their own and the physiotherapy profession may be more receptive to input from a physiotherapy student, thus reinforcing both their interpersonal attitudes and the information learned. In contrast, a student nurse who begins with a negative view of physiotherapists may discount or ignore valuable contributions from a physiotherapy student, impairing both collaboration and learning. Educators need to consider these dynamics when designing their sessions, ensuring all professions are discussed in a realistic, positive manner. To our knowledge, such effects on learning outcomes – beyond mere attitude change – remain underexplored in the literature.

The valence of prediction errors is likely to be critical as evidence suggests that we learn by a larger increment when experiences are worse than expected (e.g., Barlow et al., 2012; Stephan, 2014). These asymmetries in learning have implications for how interprofessional interactions are structured: unexpectedly positive contact may shift attitudes gradually, whereas negative contact – especially if it confirms prior stereotypes – can quickly entrench them. That said, even neutral contact is associated with modest improvements (Pettigrew & Tropp, 2006), suggesting that consistent, stereotype-incongruent exposure is still valuable. Thus, educators need to work to avoid negative contact and conflicts which may arise.

Little is known about how professional group information is stored in the brain, despite its relevance for IPE. In the absence of individual knowledge, group-based models inform predictions about how someone from a given profession will behave. There is evidence that we have dedicated neural systems for storing and processing person-specific knowledge (e.g., Frith & Frith, 2012; Quinn & Macrae, 2011; Todorov et al., 2007), which extend beyond surface features to include behavioral traits (e.g., Hassabis et al., 2013; Newen, 2015; Yomogida et al., 2014). However, how such models are shaped by professional identity remains largely unknown and is an important area for future research.

Predictive processing accounts posit that observers continually (implicitly) compare expectations to actual behavior. Mismatches prompt updates to internal models if the new information is deemed sufficiently diagnostic (see Bach & Schenke, 2017). We have shown (Schenke, 2017) that unexpected actions elicit neural responses associated with error detection (observer Error Related Negativity) followed by activity linked to hypothesis revision (Donchin & Coles, 1988; Duncan-Johnson & Donchin, 1982) – even without conscious awareness. However, such findings are limited to flexible behavioral traits and may not generalize to more stable personality impressions, highlighting the need for future research in interprofessional settings.

Strikingly, even short behavioral descriptions of strangers can elicit trait inferences (e.g., Chen et al., 2014; Vonk, 1994; Willis & Todorov, 2006). Trait – or stereotype-congruent behaviors – tend to be processed quickly, while incongruent behaviors demand additional processing and are more likely to be remembered (e.g., Hamilton & Sherman, 1996; Heider et al., 2007; Quadflieg et al., 2011). Although potentially beneficial if intergroup contact leads to unexpectedly positive interactions, this could be detrimental if the contact reinforces negative expectations. Thus, research is needed to explore how such interactions shape not only attitudes but also memory and the learning outcomes within IPE. It also highlights the importance of shaping good intergroup contact during the session.

Although others have theorized about the importance of person and situation specific knowledge in predicting the behavior of others (Barresi & Moore, 1996; Newen, 2015), we were the first, to our knowledge, to actually demonstrate this (Schenke et al., 2016, 2020; see; Bach & Schenke, 2017 for a review). We also demonstrated that attention is guided by

the behavioral tendencies of our interaction partners (Joyce et al., 2016), and others have shown gaze-cuing effects after a short delay are stored and retrieved when the individual is re-encountered (Frischen & Tipper, 2006). These findings can inform our understanding about how knowledge of the different professions (and the individuals belonging to them) within IPE can be acquired initially, and how they are used within the current learning situation. The findings can also inform our understanding of the mechanism behind the attitudes toward these individuals and groups, and the subsequent judgments about them. Together, they provide further hypotheses that can be tested by future research:

(1) Prior knowledge and attitudes toward other professions, either as individuals or groups, will be activated when they are encountered in an IPE session
(2) Attention will be affected by this prior knowledge such that it is either drawn toward or away from key information depending on *who* else is present.

A final important consideration within IPE is that each party may have a different focus in terms of the information that they believe needs to be extracted from the session. Consider, for example, a scenario-based teaching session given to a group of students from nursing, physiotherapy, and clinical psychology on the care of a patient from the initial triage of an acquired brain injury, through surgery to repair a bleed on the brain, rehabilitation, and then discharge from hospital. Although it is useful to know what is happening at each stage of patient care, the student physiotherapists, for example, are going to be less focused on what happens during the surgery itself than what happens post-surgery where they will have to consider the most appropriate treatment plan. The INSPIRE framework highlights the importance of designing IPE to meet the different learning needs that arise at each stage of patient care within such scenario-based learning when designing interprofessional sessions. This approach is crucial because during patient care it is valuable for all professionals to understand what has happened before their involvement, what will happen after, and how collaboration with other professions can enhance outcomes for the patient. Yet the depth of knowledge for what happens before and after their involvement is likely to be a lot shallower than for the specifics of their own role.

This limited depth of knowledge links closely with the concept of goal interdependence in IPE. Goals may be positively interdependent if all learners share the same goal (e.g., to learn all key session objectives) or codependent (i.e., the success of one professional's goal relies on another's success). For example, if the surgeon's goal to repair a bleed is unsuccessful, the physiotherapists' goal to support rehabilitation cannot be fully realized. Understanding this chain of interdependence is, therefore, critical for promoting mutual respect and cooperation across professions, and avoiding the type of goal conflict that arises when each party focuses only on the most professionally proximal issue(s). Research is needed to understand at what point learners mentally "leave" some information for others and what they retain themselves. The learning outcomes of the session are likely to be key here. For example, if the outcomes state that all students are expected to engage with all material, the presence of learners from other professions may not change where attention is directed. However, if the outcomes focus on team-based problem solving, some information may be implicitly "delegated" to the relevant profession, reducing the likelihood of broader understanding. Encouraging awareness of each profession's role in the wider care journey may help reinforce positive interdependence and avoid siloed thinking.

Prediction errors in IPE

A key focus for future research based on the INSPIRE framework is to investigate what happens when there is a mismatch between the implicit predictions and the situation that unfolds within the sessions. It is likely that when learning meets these predictions, there will be efficient processing of this information (which is simply added to the existing knowledge base and used to make future predictions). However, violations to these predictions will result in prediction errors. Although there is substantial evidence for the presence of prediction errors (e.g., Diederen & Fletcher, 2021), there is limited evidence to date, especially within IPE, as to what happens during these violations, and how this influences the learning process. Within the motor learning literature, such prediction errors are typically thought to lead to reevaluation either of the incoming sensory information or of the prediction itself based on evidence that information that is inconsistent with predictions is processed in more depth, and for more time (e.g., Bach et al., 2005; van Elk et al., 2009). Thus, the INSPIRE framework hypothesizes one of three outcomes (which outcomes is seen will depend on the specific session context and learning outcomes):

(1) Learners will attend more to information that is inconsistent with implicit predictions compared to consistent information to try to make it fit with their predictions.
(2) Learners will attend more to information that is inconsistent with implicit predictions compared to consistent information to reevaluate and update their initial predictions (i.e., hypothesis revision).
(3) Learners will attend less to information that is inconsistent with implicit predictions compared to consistent information because they deem it to be irrelevant.

Conclusion

To develop effective IPE, it is essential to conduct high-quality experimental and applied research. Here, we bring together evidence from social psychology and cognitive neuroscience to support the INSPIRE framework, which provides a structured understanding of the mechanisms underlying successful IPE. Importantly, INSPIRE addresses not only attitude change but also the learning of content and understanding of other professions. We offer testable hypotheses and practical guidance for designing, implementing, and evaluating IPE to strengthen the evidence base for the field, which are urgently needed given the global health and social care workforce crisis.

The INSPIRE framework generates testable hypotheses across authentic and laboratory contexts. It predicts that shaping learners' prior expectations – including contextual and intergroup priors – will influence what information they attend to, retain, and evaluate positively. In educational settings, these hypotheses can be explored by comparing standard and INSPIRE-informed briefings or by manipulating features such as equal-status framing, task interdependence, and clarity of shared goals. Measurable outcomes may include information recall, understanding of professional roles, recognition of stereotype-incongruent behaviors, observed collaboration, and reflective outputs. Laboratory studies allow precise manipulation of prior knowledge to examine its effects on attention, attitudes, and learning. Longitudinal designs are particularly valuable for assessing carry-over effects, where early interprofessional experiences influence engagement and learning in later sessions. INSPIRE, therefore, supports evaluation beyond satisfaction or attitudinal measures, enabling assessment of attention, learning, and memory over time.

Author contributions

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