The Path to Bricolage: An Approach to Facilitating Epistemological Reflexive Practice on a Pre-Qualifying Physiotherapy Doctorate

Larissa Kempenaar and Sivaramkumar Shanmugam

Glasgow Caledonian University

Corresponding author: l.kempenaar@gcu.ac.uk

Abstract

Clinical reasoning is based on principles of patient-centred care and evidence-based practice. When clinical reasoning is complex and ambiguous, these two approaches may appear at odds. Practitioners may be challenged in reconciling their professional's values, knowledge and worldviews (epistemic stance); knowledge derived through research, and the humanistic approach needed for patient-centred care. For practice to develop and provide patients with the best care, it is important that practitioners develop criticality of their epistemic stance and how this impacts on decision making. In the absence of a single, dominant practice epistemology, there is a need for a pluralistic epistemology, such as bricolage, to inform practice. Using the 'epistemic cognition' framework, the aim of this paper is to discuss teaching and learning strategies for employing epistemic stance as a critical lens to enhance reflexive practice in a pre-qualifying doctoral healthcare learners. Facilitating an ethos of safe uncertainty is discussed as a pedagogic approach to support learners in their journey through liminality towards bricolage.

Keywords: reflexivity; threshold concept; doctorateness; epistemic cognition; epistemology

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Introduction: The reflexive practitioner

Practice knowledge

Healthcare practice requires the practitioner to make decisions regarding the appropriate approach and content of care or interventions for patients. Globally, the two main models which provide the foundations for healthcare professionals and institutions to deliver transformative care are evidence-based practice (EBP) (World Health Organization, 2017) and people centred care (PCC; World Health Organisation, 2015). While these models of healthcare are generally complimentary their underlying core principles may be at odds. On the one hand, EBP requires that "decisions about healthcare are based on the best available, current, valid and relevant evidence." (Dawes et al, 2005, p.4). While the patient's values and preferences are considered in the decision-making process, at the core of EBP is scientific knowledge held by the healthcare professional. PCC, on the other hand, uses a more egalitarian approach in terms of power relations (Fix et al, 2018) as it is underpinned by a humanistic approach with the emphasis on patients' values and shared decision making (Weaver, 2015). These contrasting core principles can pose challenges for healthcare professionals' decision-making when evidence is complex and ambiguous. Healthcare professional's values, knowledge and worldviews derived from research need to be reconciled with the humanistic approach needed for PCC (Weaver, 2015).

To make sense of these challenges in relation to decision-making, it is important that healthcare professionals develop criticality when it comes to their own beliefs, knowledge, and values (epistemic stance) and how these impact their decision making. Reflexivity is, therefore, an essential part of professional practice, and is routinely used in healthcare programmes to facilitate students' critical awareness of their decision making in practice. The aim of this reflective literature review linked to the authors' teaching practice is to discuss how we

ISSN: 2044-3315

facilitated reflexive practice on a doctoral pre-registration physiotherapy programme, using epistemic stance as a critical lens to make sense of students' clinical decision making and practice. The review links pedagogic theory to the authors' teaching practice. In the first part, we will discuss epistemic stance from the perspective of research paradigms and its role in healthcare practice. We then discuss how bricolage moves beyond traditional paradigms as a helpful philosophy for practice. This is followed by introducing of the construct of *epistemic cognition* and how this may help us to understand the development of the sophistication of epistemic stance towards a bricolage position. Finally, we discuss the importance of reflexivity in facilitating this process. In the second part of this paper, we will discuss how we developed students' reflexivity on a pre-registration doctoral physiotherapy programme. In particular, we consider epistemological reflexivity as a threshold concept which scaffolds students' development, and this part is concluded by considering the educational evaluation of students' epistemic cognition.

The stance: Ontology and epistemology

At the core of decision making in healthcare practice is knowledge. Knowledge can be thought of in two ways: firstly, propositional, explicit, *knowing that* knowledge which results from formal approaches to knowledge development such as scholarship and research; and, secondly, non-propositional, *knowing how* knowledge which results from professional practice and experience. Such professional craft knowledge is intuitive or implicit and can be considered tacit (Higgs, Richardson, and Dahlgren, 2004) and not easily verbalised (Gustavsson, 2004). In contrast, propositional knowledge is more likely to be explicit knowledge as it can be more easily articulated (Gustavsson, 2004). These categories of knowledge combine to allow for the development of the theory and deduction which informs clinical decision making (Higgs, Richardson, and Dahlgren, 2004).

ISSN: 2044-3315

How these different categories of knowledge are negotiated to reach a decision depends on the epistemological beliefs of the knower. Epistemological beliefs are described as the beliefs regarding the nature of knowledge i.e. what knowledge is, how it is generated, and how it is known. These epistemological beliefs act to guide and control action, and to filter the information received and passed on (Zinn, 2012). The beliefs about knowledge underpinning healthcare practice are commonly referred to as practice epistemology, with what is accepted as knowledge and knowledge generation commonly shaped by the practitioner's own research paradigms that are, in turn, determined by their beliefs and worldviews. At one end of the spectrum is the positivist paradigm which is based on the ontological assumption that a single, tangible reality exists that is independent of the knower (Moon and Blackman, 2014; Park, Konge, and Artino, 2020). Knowledge of this reality is, therefore, objective. At the other end of the spectrum is the interpretivist paradigm which is commonly based on a subjectivist ontology that assumes that there are multiple realities or phenomena which are constructed in a social and cultural context. Here, knowledge development aims to understand individual experiences and how they are constructed. Knowledge is not considered value free because the knower imposes meaning on the object (Moon and Blackman, 2014). In sum, the practitioner's ontological and epistemological beliefs (referred to from here on as epistemic stance) are key to gaining an understanding of the reasoning and thought process which lead a practitioner to make clinical decisions.

When considering the complexity of knowledge within EBP, it is worth noting that for many healthcare disciplines, and in particular in physiotherapy, knowledge is not based within a single, dominant research paradigm. Physiotherapy has its origins within a more positivist biomedical model, but has moved towards a more biopsychosocial model. Hence, a more considered approach to knowledge is needed. Physiotherapists deal with a multitude of health problems ranging from

ISSN: 2044-3315

singular injuries, such as an ankle sprain, to highly complex chronic health conditions such as fibromyalgia. Physiotherapy practice also takes place in a sociopolitical and historical context which is constantly changing. Shaw and DeForge (2012) therefore stated that "a single, consensus-based practice epistemology is insufficient" (p.421). Instead, they propose a pluralistic approach to practice epistemology in the form of bricolage.

Bricolage

The term bricolage, introduced by Levi-Strauss (Campbell, 2019), is created by the *bricoleur* (the French word for handyman). The bricoleur or handyman uses multiple tools depending on the job that is required. Likewise, the healthcare professional will use different approaches, skills, techniques, and knowledge depending on the service user and their needs. This means that it is not appropriate to underpin decision making with a single approach or paradigm of knowledge. Instead, a pluralistic epistemological approach is required, and bricolage brings together different types of knowledge which were previously seen as mutually exclusive (Kincheloe, 2005) together with knowledge processes which are flexible, fluid, and open-ended (Rogers, 2012).

Studies which have reported on the characteristics of physiotherapy expertise (Shaw and DeForge, 2012) and of expert physiotherapists (Edwards et al, 2004) have found that that expertise and identification as an expert are based on the ability to collate and apply knowledge from various knowledge paradigms to support clinical decision making. Similarly, Edwards et al (2004) suggested that the application of knowledge in clinical reasoning by inexperienced physiotherapists can be described as either a hypothetico-deductivist or critical/interpretivist, whereas experts apply a combination of these approaches. Since the peer-designated experts in this study had between 13 to 33 years of practice experience, bricolage, as an epistemic ideal, seems to be developmental

ISSN: 2044-3315

and may only be obtained through years of experience. However, this assumption could be challenged by encouraging students and more junior practitioners to embody bricolage. Kincheloe (2005) suggests that, through a critique of their own assumptions, the bricoleur could deconstruct knowledge to form new understandings. We propose that reflexivity on epistemic stance provides the key to developing bricolage in students.

For healthcare students to practice within the convergence and divergence of EBP and PCC principles, education should focus on the students' epistemic stance to develop a sophisticated and fluid practice epistemology. One way of accomplishing this is by developing students to become effective bricoleurs.

Epistemic stance or cognition?

The discussion around bricolage as an epistemic stance seems to parallel the field of epistemic cognition. While epistemic stance is commonly used to refer to paradigms of knowledge, it is also useful to consider and integrate educational and development theory regarding the epistemological beliefs underpinning practice and decision making. *Epistemic cognition* is a term used to describe the developmental aspect of epistemological beliefs which can be defined as an "individual's beliefs about the nature of knowledge and the process of knowing" (Hofer and Pintrich, 1997, p. 117). The theoretical assumption underpinning epistemic cognition is that "learners' epistemological beliefs develop from more "naïve" views (e.g., knowledge is absolute; knowledge is an accumulation of facts) to more "sophisticated" beliefs (e.g., knowledge is relative and contextual; knowledge is a complex network) during educational processes." (Zinn, 2012, p.363)

To date, much work has been carried out concerning the importance of epistemic cognition in determining teachers' approach to facilitating pupils' learning.

ISSN: 2044-3315

Interestingly, teachers' epistemic cognition has been shown to range from singular to sophisticated epistemological belief systems; a finding which resonates with the current debate concerning healthcare practice expertise as bricolage within a pluralistic epistemology (Shaw and DeForge, 2012).

While epistemic stance is about the students' dominant or preferred beliefs about truth and knowledge within a given paradigm, and bricolage acknowledges the need to work with knowledge from a multitude of research paradigms, epistemic cognition provides a framework to consider the level of sophistication within which the student balances and integrates the different paradigms to inform decision making. To facilitate the development of such sophistication, it is essential for students to understand their epistemic stance, and this means using reflexivity to both explore explicit knowledge and make tacit knowledge explicit.

Reflexivity

Reflexivity lies at the heart of many continuing professional development (CPD) frameworks as a means of providing informal evidence of learning (World Confederation for Physical Therapy, 2011). Written reflection is commonly recognised as evidence of learning and is a requirement of most professional bodies to maintain professional registration (e.g. Physiotherapy Board of Australia, 2010; UK Health and Care Professions Council, 2018). Reflective practice including reflective writing is therefore included in most healthcare curricula to prepare students for their CPD requirements to maintain their professional registration.

There are many definitions of reflexivity, but the definition used in this article is: "an intentional intellectual activity in which individuals explore or examine a situation, an issue or a particular object on the basis of their past experiences to

ISSN: 2044-3315

develop new understandings that will ultimately influence their actions" (Tremblay, Richard, Brouselle, and Beaudet, 2014, p.539).

There are also multiple dimensions of reflexivity. It is often discussed in terms of reflection-in-action i.e. reflection which takes place while practice is carried out, or reflection-on-action i.e. reflection which takes place retrospectively (Donaghy and Morss, 2000). Furthermore, reflexivity is commonly recognised as a having iterative and vertical dimensions (Mann, Gordon, and MacLeod, 2009). The iterative dimension of reflexivity uses a renewing process seen in cyclical models such as those proposed by Borton and Gibbs (Jasper, 2013). Alternatively, reflexivity is described as having a vertical dimension which represents the depth of reflexivity as described by Moon (2007; 2009). The process by which reflexivity is carried out includes a wide range of formats including oral peer discussion, written reflective diaries and visual media (Ziebart and MacDermid, 2019). In other words, reflexivity encompasses a wide range of approaches, activities, and artefacts.

While it may be sometimes neglected in relation to healthcare practice, reflection on epistemic stance is commonly used by healthcare researchers when embarking on qualitative research, during supervision in social work and teacher training, and in various forms of psychotherapy where epistemic stance is considered key to determining the theoretical orientation of the psychotherapist (Arthur, 2001). Notably, the use of *lenses* in supervision and reflection is practiced in family therapy (Castronova, ChenFeng, and Zimmerman, 2020) where the concept of social GRRAACCEESS (gender, religion, race, age, ability, culture, class, education, employment, sexuality, and spirituality; Burnham, 2018) may be used to review how these lenses might influence relationships. Since using the notion of a lens to enable reflection on practice from a particular angle can be very useful in providing guidance and to structure reflection, we

ISSN: 2044-3315

propose that reflection through the lens of epistemic stance is key in facilitating the development of a more sophisticated epistemic cognition in healthcare students.

The approach: Shaping reflexive practitioners

The integrated Doctor of Physiotherapy pre-registration

The Doctor of Physiotherapy Pre-Registration was created to meet the needs of changing healthcare demands. The aim of the programme is to develop analytical, evaluative, creative, and skilled physiotherapists with an entrepreneurial mind-set, who are responsive to professional, social, and cultural change. The programme aims to develop doctoral graduates who are confident, transformational, responsible, and empathetic practitioners, leaders, and global citizens able to implement evidenced based practices within public and private services, effectively evolving and influencing innovative local, national, or global areas of practice and research. The Doctor of Physiotherapy at Glasgow Caledonian University is the first *integrated* doctorate of physiotherapy (iDPT) in Europe that is accredited for registration. In this context, the term integrated refers to the integration of clinical skills at registration level together with research and professional development skills at doctoral level i.e. European Qualifications Framework level 8. The professional development strand of the programme focusses on the development of the reflexive practitioner and encompasses 3 modules delivered over 3 years. In the first year, students are facilitated to develop their awareness of self within a healthcare career development framework. Then, during the second year, this awareness is expanded to include other practitioners as well as patients and carers through carrying out a service evaluation within a health and social care setting. Lastly, during the final year of the programme, students are prepared to enter the job market and engage with the larger context and developments of physiotherapy

ISSN: 2044-3315

more globally. This paper focusses on the first of the professional development modules where we introduce students to reflexivity and the use of epistemic stance as a lens for developing epistemic cognition.

The professional development framework and the reflexive practitioner

Within the professional development strand of the programme, we use the professional development framework (PDF) to clarify what is required from students to achieve doctoral level (Kempenaar, Shanmugam and Gray, 2019). This framework is based on the four domains of the Research Development Framework (Vitae, 2011). The framework's four domains are: engagement, influence, and impact; knowledge and intellectual abilities; personal effectiveness; and research governance, leadership and organisation. For our programme, the professional development strand facilitates and assesses learning in the personal effectiveness domain (See Figure 1) because each of the personal effectiveness strands require the student to have a level of self-awareness to advance in this strand. For example, self-management and the responsiveness to change are based on the process of reflexivity.

Epistemological reflexivity as a threshold concept

Viewing epistemic stance as a lens in reflexivity as a *threshold concept* can aid educators to scaffold teaching of the concept. Threshold concepts are those concepts within a discipline which are central to the mastery of a subject and are likely to be troublesome, but irreversible once understood by students (Meyer and Land, 2005). Furthermore, once students understand a threshold concept it changes how they see their subject and is likely to increase their understanding of related concepts that they had not considered until then. Threshold concepts

ISSN: 2044-3315

are bounded; crossing the threshold implies an extended and deepened use of language within the discipline (Meyer and Land, 2005).

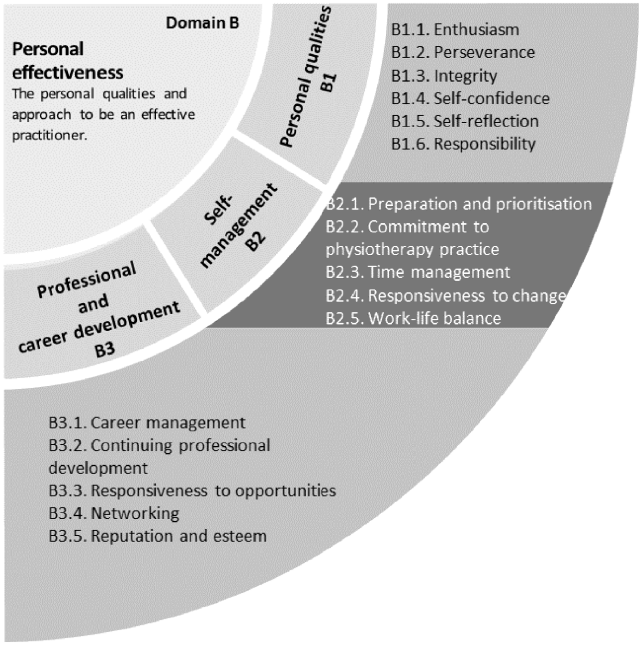

Figure 1. Personal effectiveness domain of the Professional Development Framework (Kempenaar, Shanmugam and Gray, 2019; adapted from Vitae, 2011).

The notion that a concept has a threshold suggests that there is a space before crossing this threshold which has been called the *liminal zone*; a transitional space through which the learner must pass in order to obtain understanding of the concept (Meyer and Land, 2005). Hence *liminality* can be seen as a rite of passage that is characterised by uncertainty while the learner is grappling with their new knowledge (Land, Cousin, Meyer, and Davies, 2005).

The concept of using the lens of epistemic stance through which to view practice as a method for reflexivity, i.e. the application of epistemic stance to describe, evaluate, analyse and make sense of personal and practice experiences, meets many of the criteria of a threshold concept. Understanding not only the complexity of philosophical theory, the complexity of how epistemology informs

ISSN: 2044-3315

not only their personal and professional identity, but also the identity of their peers, supervisors, and service users, is challenging to students. Once understood, students will view not only their own practice and decision making in a different light, but also the practice and decision making of other physiotherapists, patients and carers.

Using reflexivity through the lens of epistemology allows the student to make sense of challenges and decision making which occur in complex situations involving other stakeholders and with ambiguous knowledge where principles of EBP and PCC may not provide clear answers. Once students can navigate these complexities using epistemic reflexivity it is unlikely that they will be able to unlearn this and they will see other life experiences through this lens as well. The moment that students realise this is a revelation and encompasses a shift in learner subjectivity (Savin-Baden, 2020). That is not to say that reaching this threshold means that students have fully mastered fully the decision-making process as a bricoleur. The threshold concept here refers to students' awareness of using an epistemic lens for reflexivity as a tool to find a way through complexity towards a more fluid, sophisticated epistemic stance (see Figure 2). In other words, we offer the epistemic lens as a compass when navigating a maze. The compass does not tell you which way to go or where the exit is but is a tool to determine your position and a way of potentially navigating your way onwards.

Determining the threshold concept for the Professional Development strand of the programme meant that we could scaffold and structure the teaching for the first module. Scaffolding took place by considering the building blocks or steps required for students to attain the threshold concept. We approached the module by considering 3 distinct elements to facilitate achievement of the threshold concept. The first two elements were the philosophies of knowledge and models

ISSN: 2044-3315

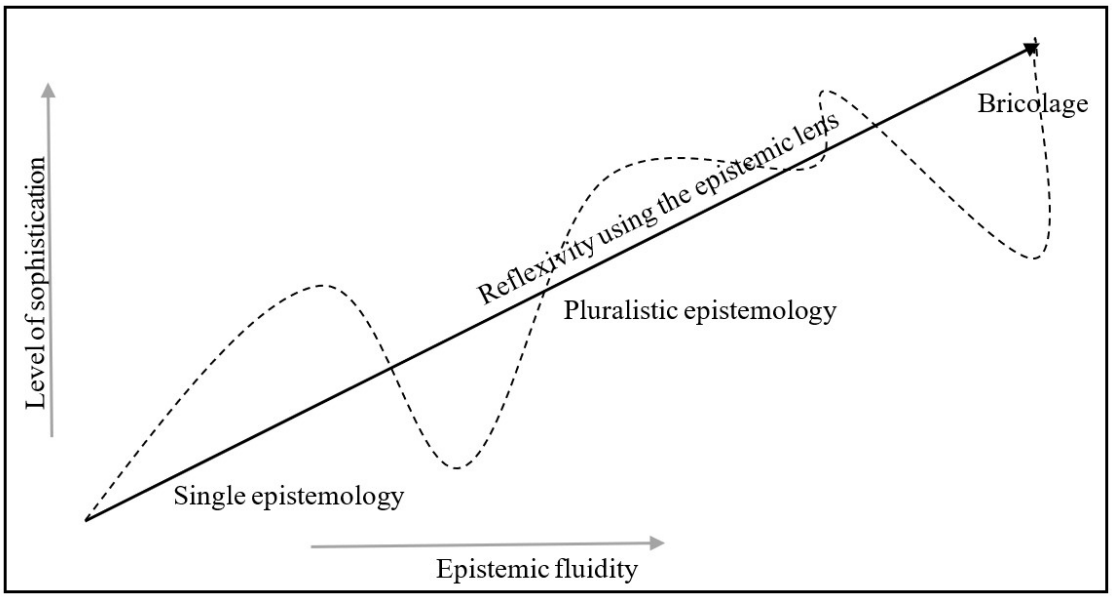

Figure 2. Visual representation of epistemic development

Note: While the diagonal line appears to represent linear development of epistemic cognition, the authors assume that the shape of the line will vary depending on the individual student. The dashed line is therefore an example of what we would consider 'normal' development.

of reflexivity (see Table 1). For each of these we considered both how we would teach the theory, the application to the student personally, and the application to the students' professional practice and to physiotherapy practice more generally. The final element consisted of the process of written reflection as a way of capturing the students' thought processes. The module was structured in two semesters, each including 3 blocks: 1) class-based tutorials, followed by 2) practice-based placements, 3) followed by another block of class-based tutorials. The module was assessed by, firstly, asking students to discuss the philosophies of practice, as well as their own epistemic stance. Secondly, students were asked to provide a written reflection on a clinical/practice experience using epistemic stance as a lens for reflection. Finally, students were asked to write a personal development plan based on their reflection.

ISSN: 2044-3315

Table 1. Themes, syllabus, methods and example activities

Theme	Syllabus	Methods	Example activity
Epistemic stance	The philosophies and paradigms of practice: • ontology, • epistemology • axiology Identity/self: • Culture, • personal history • personality • embodiment	Theory, discussion, personal application, application to practice, reflection 'in action' and 'on action'. Case studies, scenarios, peer and group discussion, personal reflection, mapping, reflective writing, reflective discussion, collage.	*Task (first semester, week 4, pre-practice placement 1)* • On an online shared platform students answer the question: What is knowledge in physiotherapy? • Students are then presented with categories and forms of knowledge with PowerPoint • Returning to the online shared platform they are asked to review and group their original posts into forms of knowledge *Task (first semester, week 9, post-practice placement 1)* • Create a timeline of your life • Resource: e.g. online shared platform (online)/flipchart and pens • Example questions for facilitated reflection in pairs: Why did you select these life events?; How did these life events shape you?
Understanding reflexivity	• CPD Frameworks • Reflexivity and CPD • Reflexivity and learning vs CPD requirements • Iterative and vertical dimensions of reflexivity • Models of reflection	Theory, discussion, personal application, application to practice, reflection 'in action' and 'on action'. Case studies, scenarios, peer and group discussion, personal reflection, mapping, reflective writing, reflective discussion, collage.	*Pre-tutorial task (first semester, week 2, pre-practice placement 1)* • Map your current abilities to the criteria of the 4 Pillars of Practice and their levels of the Post-registration Career Framework (NHS UK) using the online resources • In tutorial discussion: Review and discuss 'Where do you view yourself once qualifying from the DPT?' *Task (first semester, week 3, pre-practice placement)* • In pairs (one listener-one speaker) Discuss an experience from the last 24 hours without specific structure for 10 minutes. Swap. • Writing slot: Free write the experience discussed • Introduce one model of reflection (e.g. Gibbs) • Review writing of one student with the group onscreen and highlight in different colours the various components of the model • Students repeat this for their own writing as an independent task

ISSN: 2044-3315

Writing	• Effective and healthy writing practices • Models for reflective writing • Strategies for preparing reflective writing • Identifying learning moments for reflection	Free writing, writing to prompts, writing in fixed time slots, snack writing Application of iterative reflection in writing, revisions of writing to address vertical dimension. Peer discussion, mind-mapping, drawing	*Writing principles (second semester week 1, pre-practice placement 2):* • 5 minutes of continuous free writing as a warm-up OR 5 minutes of writing to prompt on current status and goals for writing • Peer discussion regarding status and goals • Communal, silent writing-blocks of 45-60 minutes with communal breaks • Encouragement of physical activity in breaks
Towards bricolage (throughout the module)	Facilitate the vertical dimension of reflexivity through integration of philosophies of practice	• Peer discussion • Student-tutor discussion • Independent writing • Feedback on writing	*Note:* This is not based within a single task but relies on regular and ongoing curiosity regarding students thinking. *Prompts:* • How do you think this relates to your views/practice? • How do you make sense of the situation considering your epistemic stance? • How might others' beliefs and values influence the situation? • What might be the source of your thinking?

ISSN: 2044-3315

In the first semester, during the initial class-based tutorial block, students attended three 2-hour classes per week. Each week was roughly structured with a discussion of theory and how students made sense of their thoughts and feelings regarding that theory in the first 2-hour tutorial, followed by a 2-hour tutorial considering the application of the theory to practice, and, lastly, a 2-hour session dedicated to structured reflective practice and writing. Students' learning was scaffolded by, firstly, considering the theory in conjunction with case studies and scenarios to provide exemplars of how the theory could be applied. This was followed by challenging students to consider various aspects of the self, including their identity, beliefs, physicality and how these had been shaped and transformed over time in the context of their personal history and culture. This component included a variety of activities to facilitate different learning styles and preferences and to offer different methods to explore concepts including peer discussion mind mapping, and arts-based approaches. During the writing sessions, students were given various tasks to practice their skills, ranging from free to structured writing tasks. Examples of class-based activities can be found in Table 1.

As mentioned previously, before a person is able to understand a threshold concept, they must enter a liminal zone where they engage in a journey of exploration and learning, with the liminal zone involving uncertainty due to the challenge to their existing knowledge. As a module team we took deliberate actions to ensure that students experienced *safe uncertainty* while they explore their own thoughts and feelings. Safe uncertainty is a concept introduced when providing a therapeutic environment and relationship with clients in family and systemic therapy (Mason, 1993). Safe uncertainty is a position which is always in a state of flow, and is consistent with the notion of a respectful, collaborative, evolving narrative that allows a context to emerge where new explanations can

ISSN: 2044-3315

be placed alongside rather than in competition with the explanations that clients and therapists themselves bring (Mason, 1993).

This is not to say that the lecturer acts as a therapist to students. Instead, Mason (1993) provides a position for the lecturer and student to adopt and explore the student's understanding and beliefs where there are no wrong or right answers and the student may experience ambiguity about their thoughts and whether they should express them. This absence of wrong or right can be challenging for students as they have to trust that they will not be judged on their thoughts and feelings.

To act out this position when facilitating the sessions, lecturers consciously aimed to reduce the power differential between students and themselves by providing opportunities for socialisation. This included shared coffee breaks and home baking. During the coffee breaks staff and students would share personal stories and experiences and students were actively invited to provide ongoing feedback on the module. To avoid the aspersion of the lecturer as an expert, staff and students would also discuss the challenges of teaching and learning the elements of the threshold concept. We aimed to create a collaborative learning culture of lecturer and students walking side-by-side.

As the students had explored their own personal and practice epistemology during the class-based tutorials, the subsequent 4-week practice-based placement tasked students to observe how their epistemic stance influenced their clinical decision making, and to use these observations as a basis for reflective writing. On return to the University for the third block of class-based tutorials, the practice-based learning tasks provided the material to further deepen students' learning by discussing and writing about their practice experiences more broadly. At this point, we observed the first signs that some

ISSN: 2044-3315

students were starting to see how their epistemic stance influenced decision making in practice. This became most apparent, for example, when a practice educator's approach to a patient had been contrary to what a student viewed as important in their care.

In this particular case, the student, before going on placement, had discussed a positivist preference in her epistemic stance towards research and a more interpretivist approach in her practice stance, displaying the beginnings of embracing multiple epistemologies. A placement experience the student had selected to reflect on concerned a male practice educator who had been very brusque to an elderly female patient with a chronic health condition, trivialising the day-to-day experience of the patient and dismissing the need for assessment. Instead, the practice educator provided the patient with a standard exercise sheet. Surprising the student, the patient subsequently became dismissive, and indicated her preference for treatment from the male healthcare professional. In the following university tutorial block we held several reflexive peer and lecturer-student discussions about this incident, and the student wrote an iterative reflection which she revised after each discussion to deepen her understanding in preparation for the assessment.

This situation was perceived as complex by the student, as the practice educator had used the principles of EBP in his prescription of exercise. He was not, however, concerned with the patient's wishes in accordance with PCC. However, when the student had performed an assessment and enquired about the patient wishes, she found that the patient's expectations were indeed to be given the standardised exercise prescription. While she had felt very uncomfortable in the situation, using the lens of epistemic stance, the student was able to consider her own epistemic stance, but also how her own stance appeared to contrast with those of both the supervisor and the patient. This allowed her to feel less

ISSN: 2044-3315

judgemental of the supervisor, but also more understanding of the reaction of the patient. Furthermore, the student was developing an understanding that her persistence in using an interpretivist stance with the patient had not been reciprocated by the patient, highlighting the need to develop a level of adaptability in her stance to facilitate effective PCC.

The second semester consisted of 2 weeks of class-based student-centred tutorials (4 hours per week) where we continued to reflect in discussion and writing on epistemic stance and its relation to practice focussing on the vertical dimension of reflexivity indicated in Figure 2. This was followed by another practice-based placement and a final 2 weeks of 4 hours per week of student-centred tutorials.

Evaluating the Sophistication of Epistemic Stance

Research into epistemic cognition in physiotherapy students is limited. During a search of the literature prior to commencing the module the team found that the Connotative Aspects of Epistemological Beliefs survey (CAEB) had been used in three studies with physiotherapists and physiotherapy students (Bientzle, Cress, and Kimmerle, 2014; 2019; Beenen et al, 2018). The CAEB was developed by Stahl and Bromme (2007) to measure college students' beliefs about knowledge of their subject. Connotative aspects refer to the associative-evaluative meaning of words, as opposed to denotive aspects of beliefs which refer to the explicit meaning of words. Respondents select on a polar scale which adjective of a pair most accurately represents their view on knowledge in a specific knowledge domain. The scale contains two aspects of knowledge: texture (10 adjective pairs) and variability (7 adjective pairs). Texture refers to the structure and accuracy of knowledge, e.g., confirmable-unconfirmable, superficial-profound. Variability refers to the stability and dynamics of knowledge, e.g., stable-unstable, completed-uncompleted. Answers are rated on a scale from 1-7. Lower

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scores in texture suggest that knowledge is perceived to be exact and structured, whereas higher scores suggest that knowledge is perceived as unstructured and vague. Lower scores in variability suggest that knowledge is perceived as static and inflexible, and higher scores suggest knowledge is perceived as dynamic and flexible. Stahl and Bromme (2007) suggested that lower scores represent more naïve beliefs about knowledge, while higher scores are suggestive of more sophisticated beliefs about knowledge.

Bientzle, Cress, and Kimmerle (2014; 2019) and Beenen et al (2018) used the CAEB to measure epistemological beliefs in physiotherapy students and staff to establish the influence of years of practice on epistemic cognition. The CAEB in the instance of physiotherapy asked students to rate both the texture and the variability in the domain of physiotherapy. The module team decided to use the CAEB to evaluate potential changes in epistemic cognition as it was the only tool found to have been previously used to evaluate physiotherapy students. As indicated above a higher score is suggestive of increased sophistication in epistemic stance. However, to our surprise the students who we perceived to have significant increases in sophistication in their stance based on classroom discussions and observations, scored lower at the end of the module than they did at the start of the module. Consequently, we reconsidered the face validity of the CAEB tool, and the role of the central question posed in the survey.

In the previous studies of Bientzle, Cress, and Kimmerle (2014; 2019) and Beenen et al (2018), students were asked to rate knowledge in the domain of physiotherapy, but, the validation study for the CAEB survey (Stahl and Bromme, 2007) was carried out with biology, ecology, and geography students and concerned the specific knowledge base of plant identification which mainly includes propositional knowledge that describes and predicts, and theoretical knowledge which explains and interprets. As previously mentioned,

ISSN: 2044-3315

physiotherapy practice knowledge can be categorised more broadly and additionally includes procedural knowledge that enables action, and emancipatory knowledge that empowers people (Higgs, Richardson, and Dahlgren, 2004). Moreover, physiotherapy knowledge complexity may be enhanced because of the interrelationships between the different categories of knowledge (Higgs, Richardson, and Dahlgren, 2004). For example, procedural knowledge developed through experience may give rise to propositional knowledge in the form of a specific research question. Hence, these categorisations of knowledge are not fully distinct and should be recognised as overlapping and developed through different means. Overall, it seems that knowledge in physiotherapy is not a simple concept, it is complex.

A further factor is that the dominant knowledge paradigm in the discipline of plant identification (Stahl and Bromme 2007) is positivist epistemology. While the understanding in this knowledge domain does include a range of simplistic to complex epistemic cognitions, the range does not resemble the range and complexity of physiotherapy knowledge. As stated previously, while physiotherapy traditionally has operated in the positivist paradigm, the introduction of the biopsychosocial model (Gatchel, Ray, Kishino, and Brindle, 2020) has led to a continuous increase in interpretivist research and the subsequent knowledge base in physiotherapy should now not be considered having a dominant paradigm (Nicholls and Gibson, 2010). The use of the term *domain of physiotherapy* by Bientzle, Cress, and Kimmerle (2014; 2019) and Beenen et al (2018), therefore, seems an overly simplistic approach to the measurement of epistemic cognition and is unlikely to accurately demonstrate the development of epistemic cognition in physiotherapy students.

ISSN: 2044-3315

Going forward

Our observations of both classroom discussions and students' written reflection provided us with insight into the movement of students from a more simplistic epistemic stance towards a pluralistic epistemic stance and recognition of the influence of epistemic stance on a range of stakeholders in practice. This recognition that epistemic stance is complex has facilitated students' appreciation that different patients require different approaches underpinned by differing epistemologies. Students also recognised the role of reflexivity using an epistemic lens as a means to support their journey towards a sophisticated and fluid epistemic stance of bricolage.

More research is needed to identify ways of evaluating epistemic cognition. Currently, we are carrying out a feasibility study for the using the 7 stages of the Reflective Judgement Model (King and Kitchener, 2004) to analyse epistemic cognition in iDPT student data from semi-structured qualitative interviews. These interviews are based on scenarios regarding clinical problems where the knowledge base for decision-making is complex and there is no certainty in which course of action or approach to take. The authors hope that this will provide greater insight into the process of epistemic development and inform further development of teaching and learning strategies.

Based on our experiences, there are a number of implications for pedagogic practice. Firstly, while learners are generally explicitly supported in their cognitive and psychomotor learning, it is important to recognise the affective aspects of learning particularly when learners are in the liminal zone. Providing a learning ethos of safe uncertainty and reducing power dynamics between learners and staff may aid in providing a supportive learning culture. Secondly, the pedagogic approach taken to teaching and learning of reflective practice requires more consideration. Reflexivity is a skill which requires ongoing learning and explicit

ISSN: 2044-3315

attention within curricula. Providing learners with specific lenses, such as epistemic stance, may support students in their efforts to deepen their written reflection and enhance sophistication of practice.

Reviewing and writing about the literature on epistemic stance and cognition and the role of epistemic stance as a lens for reflexivity was incredibly useful and thought-provoking for the authors in terms of making sense and integrating knowledge from a range of disciplines. This meant embracing bricolage as an approach to writing this paper. It helped us to establish a threshold concept which enabled us to scaffold students' learning and a means to facilitate students in their development of becoming physiotherapy bricoleurs.

Disclosure statement

No potential conflict of interest was reported by the authors. All materials included in the article represent the authors own work and anything cited or paraphrased within the text is included in the reference list. The work has not been previously published nor is it is being considered for publication elsewhere.

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