ORIGINAL PAPER

Assessing outdoor and environmental education threshold concepts in Australian universities

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Abstract

Communicating tertiary graduate skills and knowledge to employers is a contemporary issue in Australian outdoor education. Threshold concepts have been proposed as a positive way forward to a shared understanding between Higher Education (HE) professionals, students, graduates, employers, and other outdoor education stakeholders. While threshold concepts can offer a curriculum development framework that highlights the graduate capabilities of an HE outdoor educator, they do not specify how these concepts are assessed. In this paper, we explore the assessment of threshold concepts in HE degrees and then examine current assessment practices in HE outdoor education degrees. We highlight selected literature on assessing outdoor education in HE and then explore how other professions assess threshold concepts. Specific professions included have (a) identified threshold concepts and (b) considered the ability to practice upon graduation, as this has the most significant alignment with the professional role of an outdoor educator. We then describe current outdoor education HE assessment practices at selected Australian universities, highlighting the breadth and range of assessment methods incorporated in existing degrees. We conclude with a discussion of the role of authentic assessment and provide five recommendations for how academics might assess the seven HE outdoor education threshold concepts described by Thomas et al. (2019) to support communication of graduate capabilities to employers, students, graduates, and other outdoor education stakeholders.

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Introduction

Threshold concepts for outdoor education degrees in Australian higher education institutions

As Marsden et al. (2012) indicate, some uncertainty exists regarding the capabilities of outdoor education graduates on completion of their degree at an Australian Higher Education (HE) institution. This uncertainty has presented issues for the profession more widely, as Australian outdoor education employers may need clarification on what roles they can appropriately assign to these outdoor education graduates. Concerns include whether they can meet the required technical or group leadership proficiency standards. Such concerns stem from the great variation within Australian HE institutions' outdoor education degree offerings (Munge, 2009). The lack of a framework to explain graduate capabilities exacerbates the impact of this variation, making it more challenging to meet employer requirements (Munge, 2009).

As a result of this uncertainty, and to achieve employment, outdoor education graduates of HE institutions are being asked to demonstrate outdoor activity leader capabilities benchmarked against the Vocational Education and Training (VET) certification competencies in the Australian Adventure Activity Standards (Outdoor Council of Australia, 2019). However, these competencies do not specifically describe the additional "knowledge, skills and experience that an outdoor education graduate should acquire" to lead outdoor education programs (Polley & Thomas, 2017, p. 55). For example, although the VET competencies provide descriptions of activity leadership skills, they do not describe the complex capabilities required to facilitate learning outcomes in outdoor education, such as those about human-nature relationships, which are required of an outdoor educator.

In searching for a way to indicate complex professional capabilities, Polley and Thomas (2017) proposed the development of threshold concepts, drawing on the work of Meyer and Land (2003). Polley and Thomas (2017, p. 55) state that "threshold concepts articulate critical knowledge areas that graduates entering the profession must master…" From their review of the relevant literature, Polley and Thomas (p. 55) also established that threshold concepts must be characterised as: (1) transformative, in requiring students to undertake a conceptual shift; (2) irreversible, with students unable to go back to previous ways of thinking; (3) troublesome, with students finding these new ways of thinking uncomfortable and unfamiliar; (4) integrative, bringing together concepts that may have previously been disconnected; (5) discursive, requiring a shift in language and ways of communicating; (6) bounded, to a specific domain, but also helping students to explore the edges or conceptual knowledge; and (7) brings a new level of discursivity allowing them to communicate with professionals in their field. (Polley & Thomas, 2017).

Polley and Thomas (2017) acknowledged general criticisms of threshold concepts, such as the lack of an empirical basis, the language used to describe them, potential hegemonic pressures in developing them, and the challenges of achieving any professional accord. Still, they suggest threshold concepts offer a positive way forward to a shared understanding between HE professionals, students, graduates, employers, and other outdoor education stakeholders. Furthermore, threshold concepts can enhance

tertiary course offerings by holding student focus to articulated goals, reducing the overcrowding of the curriculum, and supporting the sharing of assessments for the mastery of critical outdoor education concepts (Polley & Thomas, 2017). Thomas et al. (2019) proposed a set of seven threshold concepts listed in Table 1.

The need for further work on assessment of threshold concepts

The threshold concepts identified in Table 1 offer a curriculum development framework, highlighting the graduate capabilities that can be achieved by completing an outdoor education degree. Via collaboration across HE institutions in various countries, Thomas et al. (2021) developed an internationally informed HE text structured around the body of knowledge that might be required to achieve each threshold concept. However, a gap remains in the existing literature regarding assessing these concepts, which is an important aspect of the learning process (Biggs & Tang, 2011; Bryan & Clegg, 2019). Agreement about assessment has the potential to provide a shared understanding between teaching staff, students, employers, and other stakeholders about the graduate capabilities of outdoor education HE graduates. Hence, this paper focuses on current assessment practices in HE outdoor education degrees and considerations for assessing threshold concepts for graduates.

The paper commences with a review of selected literature focused on investigating the assessment of outdoor education in HE. This discussion foregrounds an exploration of how other professions assess threshold concepts. The exploration of other professions focuses on a range of fields that assess the ability to practice upon graduation, such as occupational therapy (Nicola-Richmond et al., 2018), as these were deemed to have close alignment with the professional role of outdoor educators. The paper then reports on a thematic analysis (Creswell & Guetterman, 2019) of current outdoor education HE assessment practices at a selection of Australian universities. The thematic analysis utilised unit/subject outlines to identify the emergent themes in assessment tasks. To support the development of a shared understanding of assessment types, the thematic analysis highlighted the breadth and range of graded assessment methods incorporated in current degrees. These themes help develop a base understanding of how Australian universities currently assess outdoor education graduates. Following a review of the assessment, the authors present recommendations about outdoor education HE assessment to promote a shared understanding of graduate capabilities further.

Table 1 The seven threshold concepts for outdoor education graduates (Thomas et al., 2019)

No.	Threshold Concept
1	Outdoor educators create opportunities for experiential learning.
2	Outdoor educators use pedagogies that align their program's purpose and practice.
3	Outdoor educators are place-responsive and see their work as a social, cultural, and environmental endeavour.
4	Outdoor educators advocate for social and environmental justice.
5	Outdoor educators continue to develop their skills, knowledge, and expertise.
6	Outdoor educators understand and apply a strict aversion to fatalities.
7	Outdoor educators routinely engage in reflective practice.

It is noteworthy that different HE institutions use different terminology to explain similar concepts. We, the authors of this paper, are from six different Australian HE institutions, all of which use different terminology. Therefore, to support the aim of communicating across institutions while developing a shared understanding between HE professionals, students, graduates, employers, and other outdoor education stakeholders (in Australia and abroad), we first needed to agree upon the use of standard terms and to apply these throughout this paper. The terms degree and subject are central. "Degree" is used to mean the collective sequence of learning topics and knowledge related to the discipline, which each undergraduate student must complete to graduate (some institutions refer to a degree as a course). "Subject" is used to mean the division of learning topics and knowledge, combined with assessment tasks, within the degree (some institutions refer to subjects as units, courses, programs, programs, or modules). Degree and subject will be used from this point forward.

Assessment in outdoor education

Concerns have been raised about how the assessment of practical skills and knowledge enables or limits accreditation and recognition of HE outdoor education degrees (Butler, 2008; Gedye & Chalkley, 2006; Polley & Thomas, 2017; Welsh & France, 2012). There are currently no Australia-wide common or unified processes for outdoor educators to be assessed as professionals. However, there are precursors to using threshold concepts in assessing outdoor education graduates of HE institutions. For example, if a graduate has completed outdoor education studies before or as part of a recognised initial teacher education degree, they can register with the relevant state-based teaching authorities. Additionally, from 2003 to 2021, through formal training and experience, graduates could be recognised as outdoor activity leaders by the National Outdoor Leadership Registration Scheme (NOLRS). However, a lack of uptake by state organisations and practitioners has likely been a factor contributing to the discontinuation of this scheme in 2021.

From an outdoor education discipline position, the challenge has been to identify shared assessment methods, offering an acceptable level of conformity and evidence of benchmarking across the breadth of HE degrees. This conformity and benchmarking would assist employers and other stakeholders in recognising standardised terminology for communicating a graduate's capabilities and knowledge while allowing flexibility linked to location and sequencing within individual degrees.

For HE institutions, rigour, utility, and evidence provision are critical aspects of assessment (Bryan & Clegg, 2019). Rigour applies across two key areas: (1) the rigour of holding students accountable to a specific set of knowledge standards; and (2) the rigour of developing critical thinkers (Jacobs & Colvin, 2010). In developing assessment tasks that achieve this application of rigour, HE institutions require: (1) a method to establish students' knowledge and level of understanding; and (2) a progression point that determines when these knowledge standards have been met (thereby making it acceptable to move onto the next phase of learning). In addition, for outdoor education graduates of HE institutions and their potential employers, assessing the ability to apply threshold concepts to professional situations is critical for managing risk, safety, and future practice quality.

Developing equitable, measurable, and comparative learning experiences and assessments is challenging in the HE outdoor education sector (Munge et al., 2018). Central to the challenge is utilising outdoor fieldwork as a primary pedagogical method in many HE outdoor education degrees. Thomas (2015) has argued that outdoor fieldwork is the signature pedagogy of outdoor education in HE institutions. In addition, outdoor fieldwork is considered crucial because it assists in developing professional capabilities (Munge et al., 2018), is intimately linked to professional practice, and can highlight what a graduate knows and can do (Thomas et al., 2019). As such, it would be reasonable to expect that threshold concepts being assessed must be able to be applied or demonstrated during fieldwork.

Outdoor fieldwork that is integrated into HE outdoor education programs is a key component of learning to be a professional (Thomas, 2015). It offers outdoor education students (in HE) the capacity to work with their 'near-peers' and staff to develop skills and knowledge in a setting designed to foster learning and collaboration. Bester et al. (2017) highlighted the value of near-peer teaching and mentoring for participant teachers and participant students. They suggest it provides an authentic opportunity to teach and to be taught by someone who is near to you in experience and knowledge while still providing a sufficient gap, thereby establishing cognitive distance and opportunity for learning and consolidation of practice. Near-peer teaching participants gain from the experience of teaching and being taught in an outdoor fieldwork setting, along with opportunities for mentoring via staff input and feedback (Bester et al., 2017). The progression from participant to participant-teacher under mentoring is a critical step in progressing to achieving professional capabilities. Near-peer teaching in HE outdoor education degrees may provide authenticity when considering opportunities for fieldwork to function as a medium for assessment.

Although outdoor fieldwork offers many positive possibilities for professional learning and assessment, it is important to acknowledge "a serious lack of systematic empirical evaluation of the effectiveness of fieldwork as a learning strategy" (Kent et al., 1997, p. 318). Evaluating students' practical learning in the field is sometimes ad hoc, non-existent, difficult to replicate, or too heavily reliant on certain conditions. For example, the structural differences related to staff availability, resources, weather conditions and time present real challenges for assessing HE outdoor education fieldwork (Munge et al., 2018). When done poorly, assessment in an outdoor fieldwork context can lack inclusivity of people with a disability; rigour, due to vague or subjective assessment rubrics and marking criteria; integration of outdoor fieldwork with other components of academic programs; a connection between practical and theoretical concepts; and transparency of outdoor education learning outcomes or how they align with employment requirements (Munge et al., 2018). It has also been recognised that the assessment of generic skills, such as teamwork and decision-making, has seldom been a component of HE programs (Stokes & Boyle, 2009). However, HE institutions are increasingly reporting generic capabilities as graduate outcomes (Boyle et al., 2009; Polley & Thomas, 2017). With specific applicability to the outdoor education profession, these graduate outcomes are likely to become more commonly used as essential learning outcomes, which also require assessing.

Assessment of threshold concepts in similar disciplines

The assessment of threshold concepts is a recent topic in academic literature (Simper, 2020). Several disciplines outside outdoor education have attempted to apply and assess the achievement of threshold concepts. When investigating potential threshold assessment practices for occupational therapy, Nicola-Richmond et al. (2018) identified a range of HE disciplines that have been researched in relation to assessing threshold concepts. These disciplines include information technology, economics, business and commerce, business (in society), mathematics, engineering and performing arts. They identify a further ten professions, including occupational therapy, that assess threshold concepts in HE. However, some concern has been expressed about the validity and replicability of the studies conducted (Tierney, 2017), specifically when the acquisition of only one threshold concept was measured, with a possible lack of alignment with graduates' ability to think holistically and act like professionals. This concern was supported by Barradell (2013), who noted a lack of literature exploring stakeholder involvement (beyond the HE environment) in developing threshold concepts for physical educators. Several other authors also acknowledge the challenges of designing quality assessment tools that capture student progression through the messy learning space of fieldwork, including outdoor fieldwork in outdoor education (Thomas & Munge, 2020) and other pedagogical practices (Hedges, 2015; Land et al., 2005; Shanahan et al., 2006). Thomas and Munge (2020) highlight the importance of allowing for messiness in outdoor fieldwork whilst also acknowledging that such messiness presents challenges for educators in managing learning outcomes and assessment.

In Australia, based upon research conducted by Nicola-Richmond et al. (2018), few professions could apply threshold concepts as a framework for teaching, learning and assessment across an entire academic program. However, we single out two professions to further discuss implementing and assessing threshold concepts in outdoor education. The first is physiotherapy, a profession that has embedded the assessment of threshold concepts in its accreditation processes (Physiotherapy Board of Australia, 2015). The second is occupational therapy, where the assessment of threshold concepts has been the subject of research (Nicola-Richmond et al., 2018). Occupational therapy and physiotherapy share professional expectations for graduates, assessed via threshold concepts, in order to be considered ready to practice. Being ready to practice also applies to outdoor education graduates of HE institutions. Additional similarities between occupational therapy, physiotherapy and outdoor education include a focus on patient/client safety; valuing experiential learning; emphasising the importance of affective interaction with patients/clients; application of psychomotor/kinaesthetic skills; and critical thinking to engage with novel situations (Brzuz & Gustafson, 2019; Harper & Robinson, 2005; Naidoo, 2003; Occupational Therapy Board of Australia, 2012; Physiotherapy Board of Australia, 2015). As such, discussion of learning, teaching, and assessment practices in these areas is pertinent for outdoor education.

Several key ideas are evident from previous work (for example, Brzuz & Gustafson, 2019; Harper & Robinson, 2005; Naidoo, 2003; Occupational Therapy Board of Australia, 2012; Physiotherapy Board of Australia, 2015), which can help deter-

mine whether students have genuinely made the transformative conceptual shift that threshold concepts require. These can be grouped into three key areas, which have the potential to guide the design of future threshold concept assessment methods and tools. The three key areas identified include (1) constructive alignment, the integration of assessment with teaching and learning; (2) authentic assessment, linking real-world practice and actions to assessment; and (3) integrative learning, integration of learning and teaching practices for knowledge transfer from the study context to the reality of practice. These three key areas are explored further below.

Constructive alignment: the integration of assessment with teaching and learning

Biggs and Tang (2011) established the concept of constructive alignment to improve the connection between assessment, degree design, and outcomes. As a result, constructive alignment has become a core component of assessment and degree design in HE (Land et al., 2005). However, for assessment to enhance student learning and explore troublesome knowledge, teachers must understand how particular threshold concepts are acquired (Boud & Dochy, 2010; Tierney, 2017). Troublesome knowledge is described here as that knowledge which is at first counterintuitive or alien that may require learners to let go of previous ways of seeing things (Polley & Thomas, 2017). Once teachers understand how students move through the planned learning progressions, then aligning and sequencing the teaching, learning, and assessment can be appropriately established.

Tierney (2017) indicates that aligned assessment must feature in ongoing processes to determine whether students have experienced an irreversible shift in thinking, a notable characteristic of meeting threshold concepts. Similarly, Devanas (2014) found that continuous formative assessment is necessary to promote and measure a change in student learning and to keep students motivated in the learning process. Higgs (2014) problematised the assessment of one final product, suggesting that doing so misses the messiness that can be thought of as evidence of transformative learning. Hence assessment of threshold concepts should be ongoing and frequently revisited throughout the study sequence (for example, across multiple subject areas). However, a further question about the need to accommodate different students mastering concepts at various points, some earlier and others later, remains. Consideration must be given to whether assessment should be flexible enough to cope with this occurrence, or if there is a need to provide rigidity in the timing of demonstrating achievement of thresholds between year levels or degree sequences.

Unquestionable is the application of both formative and summative assessment in promotion of regular and continuous feedback opportunities. Several studies identified that ongoing feedback was critical to assisting students' transformation of thinking and understanding (Boud & Falchikov, 2006; Harlow et al., 2011; Nicola-Richmond et al., 2018). Specifically, Harlow et al. (2011) argue that deliberately planning time for feedback is important to reduce the likelihood of student confusion. They also suggest that this must be considered in sequencing subjects to assist students in navigating ideas and their understandings of threshold concepts, which are not necessarily acquired in a defined period. These ideas prompt the need to rethink

assessment processes and potentially requires a change to current teaching practices in various HE degrees.

Nicola-Richmond et al. (2018) described several studies assessing threshold concepts that did not align with curriculum delivery. In these studies, the threshold concepts were not addressed with students until the teaching and learning processes were finalised. This lack of alignment created ambiguity and a loss of connection between the learning process and the role of being assessed for the threshold concepts. The pitfalls of this have been recognised by Simper (2020), who notes that without constructive alignment, assessment "can target skills of little importance" (p. 8) to the learning outcomes. Furthermore, a lack of constructive alignment can lead to an inability amongst students to grasp the thinking required to acquire a threshold concept (Nicola-Richmond et al., 2018).

The importance of aligning assessment is present in examples of a flipped learning approach used in anatomy and physiology subjects, with formative assessments conducted regularly via pre and in-class problem-solving quizzes (Akkaraju, 2016). The purpose of the formative assessments was to provide timely and contextualised feedback. The summative assessment was then based on student performance in three lecture examinations (examinations taking place during lectures). The choice to structure the summative assessment in this way was to establish students' factual, conceptual, and procedural knowledge. The findings revealed that the students in the flipped learning sections, as opposed to the traditional offerings, performed "significantly better in terms of pass rates, retention rates, and overall performance" (Akkaraju, 2016, p. 34). This finding supports the notion that assessing threshold concepts should include formative assessment in an ongoing way (Higgs, 2014). Harlow et al. (2011) suggest that ongoing assessment increases the ability to provide high quality and contextual feedback to enable students to continue progressing. Threshold concept acquisition might then be determined by summative assessments that have been built from formative experiences and assessments. From these findings, the value of constructively aligned and sequenced teaching, learning, and assessment across a degree enables the time needed for meaningful learning to occur.

Authentic assessment: linking real-world practice and actions to assessment

Authentic assessment refers to alignment between the assessment situation and professional application. For assessment to be authentic in this way, students must "use the same competencies, or combinations of knowledge, skills, and attitudes … in the criterion [assessment] situation [that they would] in professional life" (Gulikers et al., 2004, p. 69). Authenticity in assessment and its connection with learning enables students to engage meaningfully with troublesome knowledge (Tierney, 2017). In turn, engaging with troublesome knowledge in new and unfamiliar situations, including those that require contextual decision-making, promotes the demonstration of crossing the concept threshold (Tierney, 2017). Designing an assessment that captures the messiness of interacting with this troublesome knowledge and resulting solutions demands authenticity in how students experience and apply the required actions and understanding. Tierney (2017) argues that there is a need to enable students to work and be assessed in the context and within the discipline requirements.

The design of an authentic assessment of threshold concepts presents a range of advantages that reflect enhanced capabilities and understanding. Tierney (2017) found that higher grades emerged when students were assessed on concepts that required linking practice and actions. The students' understanding was enhanced when critical concepts were posed as problems requiring actions. Similarly, Springfield et al. (2017) determined that "authentic assessment activities enabled students to engage with troublesome knowledge and demonstrate threshold crossing" (p. 126) by integrating knowledge with progress towards professional application. More specifically, Nicola-Richmond et al. (2018) determined that authentic assessment promoted through a contextual application enhanced students' threshold understanding of social justice issues. We believe it reasonable to suggest that to enhance the authenticity of assessment and encourage deeper engagement with threshold concepts, a student must be required to *think* and *act* as if they were professionals in their field.

Rodger and Turpin (2011) reported the development of five threshold concepts for occupational therapy at the University of Queensland. Springfield et al. (2017) explored the assessment of these threshold concepts when using them as a framework for teaching, learning, and assessment. They noted that authentic assessment, using problem-based tasks that mirrored occupational therapy practice, was the most effective way to engage students and achieve higher learning outcomes. Tierney (2017) explains that problem-focused activities should form the foundation of assessment to enable authenticity. Furthermore, the tasks should be scaffolded, allowing student development to be matched with progressive increases in task complexity and expected levels of autonomy.

Springfield et al. (2017) highlights that due to the nature of progression through a liminal or transitional space, where students move from partial or limited understanding of a concept to a much deeper appreciation, it must be recognised that conceptual understanding will develop over time. As such, methods of assessment should enable students to capture and reflect on this progression, which may not be bound by a specific timeframe or occur based on a specific event. For example, logbooks and journals of fieldwork and professional practice in outdoor education present an opportunity to demonstrate experience and learning over an extended time period over many subjects. In the case of occupational therapists, students were asked to apply child health conditions to occupational therapy models before preparing written reports of application. The prepared reports, combined with the provision of feedback on peer reports, formed a reflective process to inform the development of plans for future therapy sessions (Springfield et al., 2017). Springfield et al. (2017) argues that the process of progression through liminal space is optimised when students are exposed to variations in phenomena and have opportunities to reflect on and rework practices. Furthermore, maintaining records of practice is a pedagogical strategy notable in the accreditation requirements for several disciplines such as occupational therapy and outdoor education. Therefore, the scaffolding of fieldwork to inform a professional practice log and peer reflections to observe variation in phenomena could be considered an authentic assessment task for outdoor educators as a method noted for developing and assessing threshold concepts (Tierney, 2017).

Integrative learning: integration of learning and teaching practices for knowledge transfer from the study context to the reality of practice

Transitioning from student to professional practitioner is an important milestone in any graduate's journey (Clouder, 2005; Harlow & Peter, 2014). Several authors argue that an accurate assessment of whether students have acquired threshold concepts is determined by how well they have transitioned from student to professional (Akkaraju, 2016; Blackshields et al., 2012; Springfield et al., 2017). Integrative learning (or integration of learning - not to be confused with interdisciplinary learning where different content areas are taught simultaneously) is the discovery of similarities between ideas (connection), the transfer of learning from one context to another (application), and the development of new ideas by combining insights (synthesis) (Barber, 2012). Integrative learning can assist students in building habits that prepare them to make sound judgments and informed decisions when working as a professional in a real-world context (Huber & Hutchings, 2004; Woodside, 2018).

Drawing from disciplines beyond outdoor education, Ryan (2010) describes an example from neonatal intensive care in which medical students are required to think as reflective doctors. Specifically, the students are required to demonstrate a capacity to attain humanism, referring to the quality of being human as a threshold concept. By engaging with teaching and learning within a neonatal intensive care unit, the emerging doctors had to show evidence across a variety of characteristics of being a good human with respect to being a doctor. This included showing respect for patients and their views, attending to the psychological well-being of the patient and carers, and showing good communication and listening skills. In evaluating the characteristics of threshold concepts and their relationship with integrative learning, Higgs (2014) explains that these practices provide students with multiple perspectives and require them to "think interactively and ultimately practice as reflective, humanistic doctors who care" (p. 17). In support of the need for learning to be integrative, Kilcommins (2010) found that when legal education did not embed learning in the realities of practice, deficiencies were identified in students' capabilities and ability to transfer learning.

North and Brookes (2017) outlined the established use of case study analysis in an outdoor education context. Specifically, they used fatalities in outdoor education settings as an authentic approach to understanding risk and safety management processes. These analyses provide real-world approaches for future practice. North and Brookes highlighted that while no person wishes to experience the situation themselves, through the analysis of risk management reports, coroners' reports, newspaper articles and associated documents, students report on the implications of the situation, and process how and what led to the incident and what applicable outcomes can be utilised in their own future practice. This practice of case study analysis highlights the assessment of one of the key threshold concepts for outdoor education graduates: a heightened awareness of fatality prevention (threshold concept 6 in Table 1). This finding might suggest that in assessing threshold concepts, the ability to transfer learning may be partly determined by whether students have, in the educational setting, had the opportunity to apply knowledge and capabilities in a context in which

a professional would be required to do so; in what could be called the real world of that profession.

Designing learning and assessment tasks that replicate the professional world can be challenging. Working as a professional without experience or controlled practices can pose a range of risks to students and their near-peer participants. If a transfer of theoretical learning is expected, and opportunities for messy learning and contextual engagement with troublesome knowledge are not supported, threshold crossing may not be achieved (or authentically assessed). In exploring integrative learning and threshold concepts with students studying criminal justice, Conneely and O'Leary (2010) discovered that students often struggled to connect current work and previous modules; however, making such connections was assumed by teachers. Through adjustment to coursework and assessments, Conneely and O'Leary (2010) revealed that the chances of success in grappling with threshold concepts were improved when the degree encouraged more meaningful and explicit connections between subjects and built the capacity for integrative learning.

Several authors have acknowledged the challenges in designing tools and processes that identify threshold crossing (Hedges, 2015; Nicola-Richmond et al., 2018; Shanahan et al., 2006; Springfield et al., 2017), thereby highlighting the need for teaching, learning and assessment to be in contextual, work-integrated learning environments. To assist students in grappling with troublesome knowledge, ongoing learning and assessment should be authentic and require students to apply themselves in real-world contexts. Nicola-Richmond et al. (2018) suggests that for genuine threshold concept acquisition in performance-based disciplines – outdoor education can be positioned as such – students must be required to demonstrate their knowledge and skill acquisition. Specifically, Harlow and Peter (2014), using leadership as an example, identified that the perception of learning does not immediately translate into professional practice and must be supported through ongoing application.

Teaching and learning practices should focus on contextual application and transfer across various settings to determine whether threshold concepts have been learned and acquired. This necessity for evidence may require multiple opportunities to link knowledge and prior experiences, supported by ongoing and timely feedback (Boud & Falchikov, 2006). Tierney (2017) supports this notion by suggesting that learning across the degree should not be siloed by subjects. Instead, a plan for progressive and scaffolded experiences that authentically assess the required learning in the context of acting like a professional is required. Furthermore, feedback should promote enhanced development and transfer so that both student autonomy and real-world application gradually increase to support the transfer of learning. Advancement toward threshold crossing might then be indicated by an ontological, epistemological, and pedagogical shift in students' thinking and practices as they transition to being newly developed professionals. For us, this means students graduating as outdoor educators. Finally, the use of degree-specific graduate outcomes aligned with capstone subjects has been suggested by some academics (van Acker et al., 2014) to enable a constructive alignment between sequentially linked and scaffolded coursework activities that would allow summative assessment of a graduate outcome. The capstone subject is developed by auditing each previous sequential subject's learning outcomes and assessment types and establishing a final point of formative and sum-

mative assessment to provide evidence of learning from degree commencement to preparation for completion.

Benchmarking current outdoor education assessment practices in higher education

To investigate possibilities for benchmarking current outdoor education HE practices, all members of the Australian Tertiary Outdoor Education Network, a network open to all outdoor educators working in the tertiary sector, were invited to participate in this research and a working group was formed consisting of the six authors who were staff members of six different Australian universities offering degrees or specialisations in outdoor education (Australian Catholic University; Flinders University; University of Notre Dame Australia; University of South Australia; University of the Sunshine Coast; and Victoria University). We, the authors of this paper, include those who made the initial request and those who replied and collaborated.

We recognise that although various degrees across four Australian states have been represented, not all HE degrees offering studies in outdoor education have been included. While not claiming to represent all Australian universities, the investigation does indicate a breadth and range of current assessment practices. At the time of the investigation, all degrees included a minimum of three-quarters of a year of studies in outdoor education. However, the degrees selected had not mapped the outdoor education threshold concepts to their program design or aligned assessment to specific threshold concepts. As such, the assessment practices identified were a snapshot of current subjects, which may be suited to assessing threshold concepts, or on further investigation, may reveal the need for alternate or modified assessment tasks. Another limitation is that the research did not seek to map the assessments as formative or summative or by year-level progression. Rather, we sought to categorise the breadth of current assessment practices.

Outline of the method of research approach

Participating universities were requested to provide outdoor education-specific subject outlines, demonstrating learning outcomes and assessment types. Forty-nine subjects and 191 assessment tasks were collated and evaluated. Information was tabulated in university groups for initial thematic analysis. The first stage of thematic analysis involved noting the overall impressions of the 49 subjects and their 191 assessments to gain a general sense of the data and to identify common themes. Once a basic understanding of the data was gained, a more in-depth examination of the assessments was conducted by sorting and refining the raw assessment data into relevant themes, represented by categories of assessment types (Creswell & Guetterman, 2019). Once the assessment data were coded into the main themes, a more meaningful understanding of the data was then sought. An inductive approach was used by searching for recurrent and overlapping themes, with a particular interest in commonalities and divergences between the assessment tasks (Merriam & Tisdell, 2016).

Establishing common assessment terms

The six participating universities used a broad range of terminology to describe the same and similar assessment tasks. For example, performance-based or outdoor fieldwork activities (authentic assessment for an outdoor educator) were referred to as skill demonstration and assessment, and field-based interpretation. In addition, they demonstrated knowledge of flora and fauna, leadership skill evaluation, facilitation of group activity evaluation, facilitation skills assessment, navigation exams, peer assessment of skill learning, and self-assessment of practice. McDonald et al. (2013) highlight that a lack of common language in pedagogical practices can hinder shared knowledge and scholarship between different discipline areas and settings. This wide variation in terminology highlights and potentially reinforces the need and opportunity to develop a common language regarding assessment. A common language can assist researchers, students, practitioners, employers, and educators across various settings to understand the student, practitioner, and educator capabilities (McDonald et al., 2013). However, it is acknowledged that there are significant structural barriers to common assessment terminology, where individual universities develop their assessment policies and procedures in isolation from other universities. Further, McDonald et al. (2013) acknowledge the pursuit of identification of core practices and common language being interpreted as advocacy for these practices and potentially diluting important situational nuances and differences.

The various assessment types (and their names) were grouped via thematic analysis into categories, with six key areas identified as common assessment methods across the 49 outdoor education subjects. These categories of practices within the assessment descriptions were reviewed, critiqued, and agreed upon by consensus among all six authors. As a result, the authors proposed common terms for each of the six key assessment areas, as identified in Table 2. These include: (1) examinations; (2) outdoor fieldwork; (3) reflective tasks; (4) multimedia tasks; (5) presentation skills; and (6) written tasks. If used within the Australian HE outdoor education sector, these common terms (also used for the remainder of this section) may help clarify graduate attributes from outdoor education subjects and degrees, for educators, employers, graduates, industry partners, stakeholders, and current and prospective students.

The lack of consistency in terminology, as identified by the initial thematic analysis, was a surprise to all of us, and an area we felt needed to be addressed as a starting point. However, as this sits beyond the scope of our current paper it is intended that further research will be required to conduct a more in-depth analysis of assessment to explore types of assessment, levels of difficulty, nature of the tasks (for example, formative or summative assessment), and assessment at specific year levels. We suggest that further investigation should also consider learning outcomes with reference to specific threshold concepts.

Current assessment practices

As anticipated, because HE degrees must comply with the levels of the Australian Qualifications Framework (AQF Council, 2013) and standards of the Tertiary Education Quality and Standards Agency (TEQSA, 2021), there were similarities between

Table 2 Assessment types: commonly used terms and methods of assessment

Assessment Type Theme / Proposed Common Term #	Commonly used terms and methods of assessment
Examinations	Tests/ quizzes/ invigilated exams
Outdoor Fieldwork*	Skill demonstration and assessment/ field-based interpretation and demonstration of flora or fauna/ leadership skill evaluation/ facilitation of group activity evaluation/ facilitation skills assessment/ navigation exam/ peer assessment of skill learning/ self-assessment of practice
Reflective Tasks	Activity logbook/ journal/ reflection/ report/ portfolio/ reflective logbook/ peer feedback
Multimedia Tasks	Video recording/ website design/ podcasts/ blogs
Presentation Skills	Individual and group: presentations/ facilitation tasks/ seminars/ leading activity sessions/ panel discussions/ debates/ mock interviews
Written Tasks	Assignment/ essay/ investigation/ project/ report/ documentation/ workbook/ advocacy plan/ menu/ checklists/ Curriculum Vitae/ letters/ case study/review/program planning / manual

\# This does not provide a definitive list of all potential/possible assessment approaches but aims to represent those currently used in practice

outdoor fieldwork activities are characterised by practical fieldwork/ hurdle tasks/ in-field tasks/ expedition/ practical skills/ leadership skills/ facilitation/ practicum/ laboratory/ simulations as well as including activity-specific or industry certifications, such as wilderness first aid, paddle certificates, surf lifesaving awards, and sailing tickets, or licences

all the institutions in how they assessed students' knowledge and level of ability. For example, assessment was ongoing and used across all subject areas. In addition, there were consistent philosophical and pedagogical understandings evident. Specifically, across the universities, aspects of outdoor fieldwork activities, written tasks, presentations, and examinations were assessed.

The coding and subsequent analysis of these assessment practices revealed that outdoor fieldwork tasks were the most common type of activity to be assessed across all the subject areas that included outdoor fieldwork as a component of their learning activities and degrees. Coding highlighted the integral role of outdoor fieldwork learning in providing outdoor educators with rich learning and assessment opportunities and further emphasised the role of outdoor fieldwork in outdoor education subjects and degrees. However, although assessing this type of activity was common, their marking and weighting varied between and even within institutions. For example, some practical skill assessments were mastery-based with a pass/fail or hurdle requirement. In contrast, others focused on affective or meta-skills and were marked using criterion-referenced rubrics. Although this variation may be appropriate for different learning outcomes, seeking some congruency in marking tools for the threshold concepts could assist the communication of graduate outcomes.

Outdoor fieldwork activities were the most common type of assessment, however written assessment tasks were the second most common and used across all universities. These included essays, projects, case studies, reports, manuals, reviews, letters, and workbooks. Across all the universities, the written tasks firmly centred around experiential learning activities as it was identified that in all degrees there were subjects that involved planning and investigating experiential learning activities or programs. For example, it was common to see tasks that required the students

to "investigate, apply and evaluate their knowledge of solo journeying experiences" (Australian Catholic University) and develop a "leadership plan for a high-adventure, outdoor education experience" (University of the Sunshine Coast).

The use of written tasks suggests that the capacity to adequately document planning and program development is a basic requirement of outdoor education degrees in HE. Logbooks and reflection tasks were evident in all degrees; however, logbooks were featured less often because these were considered a reporting task and a sector expectation rather than an ongoing assessment practice. Reflective written tasks were standard, particularly in the higher-level subjects (those that occurred later in the degree). Evidence of reflective assessments is consistent with the higher-order critical thinking expected of graduates with a Bachelor level degree (Australian Qualifications Framework, 2013). This evidence supports the previously discussed work of Tierney (2017), who suggests that learning across the degree should be progressive, scaffolded, and reflective of what a professional requires. Developing a robust reflective practice is essential to threshold concept seven, which indicates that outdoor educators routinely engage in reflective practice.

As noted, presentations, multimedia tasks, and written examinations including tests, quizzes, and invigilated exams, were also used as assessment tools. While examinations were used much less than the former methods, they represented up to 40 per cent of assessment weighting in some subjects. The presence of written examinations demonstrates that this form of assessment still plays a role in assessing outdoor knowledge and skills, including understanding practical skills.

A common focus for written tasks was safety and risk management, aligning with threshold concept six (understand and apply a strict aversion to fatalities). All six universities required their students to demonstrate their skills and knowledge in developing risk management plans at least once within the suite of subjects comprising an outdoor education degree. In some cases, an entire subject was focused on risk minimisation and management, for example, the subject "Risk management in natural environments" (Victoria University). While this subject was not the only one in the degree related to risk management, it helped raise concerns about assessing threshold concepts in isolation from other knowledge development. This is contrary to Boud and Falchikov's (2006) and Tierney's (2017) recommendations to assess using progressive and integrative approaches. It might be suggested that assessments linked to threshold concepts could be formative to enable ongoing contextualisation that draws on a framework of knowledge and evidence of application rather than siloed subjects.

It was evident that written tasks were heavily utilised in assessing risk and safety management. However, it is a point of note and one discussed at length by Brookes (2018) and others that fatality prevention goes beyond the scope of written methods of knowledge acquisition and requires active engagement with case studies (North & Brookes, 2017), appraisal of environments, forms of participation and reflective practice. It appears that a methodology of assessment aligned with threshold concept six, fatality prevention, is required to better appraise outdoor education graduates' attainment of this threshold concept.

Conclusion and recommendations

In this paper, we have described how six universities currently assess outdoor education in HE to explore how academics might consider the design of assessment practices for the assessment of the seven threshold concepts for outdoor education graduates, as described by Thomas et al. (2019). The main aim has been to consider the possibility for some level of consistency in assessment and related terminology to support the communication of graduate capabilities to employers and other stakeholders. However, many avenues of inquiry remain unexplored, such as how to ensure that assessment is inclusive, fair, equitable, and accessible, as suggested by Nieminen (2022).

Acknowledging this deficit, based on our review of available literature on the assessment of HE outdoor education student capabilities, other professions that assess practice-based professionals, and current HE assessment practices, we make the following five recommendations for the next steps in supporting a shared understanding between HE institutions, students, graduates, and employers regarding what a graduate knows and can do as an outdoor educator. By providing recommendations on the development of common terminology and tools for assessment, this paper will assist in paving the way for further investigation of the national use of threshold concepts in the assessment of outdoor education degrees in HE institutions.

Recommendations

Recommendation 1: development of shared (national) authentic assessment tool(s)

We acknowledge the challenges of assessing the seven threshold concepts proposed by Thomas et al. (2019). These assessment challenges include ensuring rigour, utility, provision of evidence, equity, measurement, and comparison. However, reviewing current outdoor education HE literature, the practices of other professions, and current university practices, we have argued that a key component of transitioning from student to professional is authentic assessment in an outdoor fieldwork setting where the student undertakes the role of an outdoor educator in practice.

Developing a common authentic assessment terminology and using assessments matched to thresholds could provide the scaffold for developing assessment tools that would support shared understanding between students, practitioners, educators, and employers across a broad range of contexts about what an outdoor education graduate knows and can do. Such a common assessment tool(s) would need to acknowledge diversity in the range of contexts, places, and differences in individual and institutional requirements, including nomenclature, copyright and intellectual property associated with subjects and degrees. To achieve this, it will be important for those developing such a tool for outdoor education in HE to engage in a consultation process with all HE providers and, ultimately, employers.

Recommendation 2: sequential alignment of threshold concept development and ongoing formative assessment

We recommend that HE degrees in outdoor education consider embedding threshold concepts within subjects and degrees in a sequential manner that would allow for ongoing formative assessment related to each threshold concept to enable the transition to *becoming* and *being* an outdoor educator. Springfield et al. (2017) and Tierney (2017) identified that assessment in context and discipline requirements are important. Therefore, it would be expected that fieldwork-based outdoor evaluations, which require students to think and act as if they are a professional in the field, would be the most authentic and beneficial, not just for the direct learning outcomes but also for helping to create more socially aware individuals, as per the findings of Nicola-Richmond et al. (2018). By introducing the relevant threshold concepts early within a degree and allowing for sequential development of knowledge and skills aided by formative assessment, students will transition from participant to outdoor educator with near-peer teaching, under the guidance of the academic staff.

Recommendation 3: use of common and consistent language for assessments

A range of descriptors was identified to describe different assessment practices in outdoor education degrees in HE institutions. The use of these common terms (Table 2) provides descriptors that allow for a broad range of interpretations and nuances yet still provide a common language for educators and employers. Acknowledging that each institution sets its assessment terminology, these terms provide a common starting point for developing shared assessments aligned to common assessment types.

Recommendation 4: active collaboration and co-development of assessment strategies

To ensure the ideas presented here are used to enhance understanding of HE outdoor education graduate capabilities, we advise that these proposed recommendations be discussed with key outdoor education stakeholders, including employers, to encourage broader collaboration and to develop a strategy to effectively assess the draft outdoor education threshold concepts in a meaningful and authentic manner.

Recommendation 5: use of threshold concepts in assessment design

Consideration should be given, and reference made, to understanding by design, specifically the notion of backward design (Wiggins & McTighe, 2005). The backward design framework suggests that instructors should consider these overarching learning goals (in this case, the threshold concepts) and how students will be assessed prior to consideration of how to teach the content. This design process draws alignments with the need to scaffold learning and assessment authentically and recognises that information regarding how to teach threshold content in outdoor education is not currently available. Backward design is considered a much more intentional approach to degree design than traditional approaches. The inclusion of this approach could help

to minimise some of the perceived challenges associated with fieldwork preparation, participation, and reflection.

Declarations

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