Laying Down a Path in Walking: Student Teachers' Emerging Ecological Identities.

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Abstract

There is growing global awareness of the importance of what are often labelled as 'natural environments' for human health, well-being and cognitive development. However, fostering learning in such 'natural environments', as they may be differently experienced and understood, requires a review of theoretical and practical approaches in teacher education, foregrounding the sensorial, experiential, embodied and relational dimensions of learning processes. This paper presents the results of an exploratory study on the experiences of a group of first year undergraduate student teachers enrolled in a newly introduced course on outdoor learning. Adopting a pragmatic and enactivist mixed methods approach, the study provides evidence of impact of the course on the students. Specifically, the study contributes a qualitative description of student teachers' learning trajectories, featuring what students deemed to be significant moments of an emerging ecological awareness. Findings point to important implications for curriculum and pedagogy, promoting environmental consciousness in formal teacher education contexts.

Introduction

'…how we think about nature guides how we act towards nature.' (DeLuca 2005, p68)

Seeking to respond to global environmental crisis on the living Planet, a growing body of literature calls for a reconceptualization of the aims and practices of traditional environmental education. Moving from conceptual to experiential approaches, outdoor learning in teacher education contexts (Christie, Beames, & Higgins, 2016; Nazir & Pedretti, 2015; Payne, 2006) is put forward as a means to encourage perceptions that favour more sustainable approaches (Author 1 and 2, 2009). Supporting and understanding the educational shift from local experiences to wider understandings of sustainability issues however, poses ongoing philosophical challenges, due to the contested nature of the field and the need for further evidence and articulation of methodological issues in practice. Drawing upon the experiences of a group of first year student teachers enrolled in an outdoor learning course at a Higher Education institution, this study looks to extend theoretical grounding, by incorporating insights from a range of disciplines, anthropology, evolutionary biology and philosophy, in order to assess the epistemological and methodological potential of this kind of environmental education to destabilise the premises of traditional teacher preparation. In particular, our attention is on the development of pre-service teachers' ecological identities, defined as the 'sense of self as part of an ecosystem' (Olivos et al. 2011, p12), and how these may be supported in the University context. Such a focus is captured through an analysis of students' emerging sense of psychological connectedness to nature, the development of their ecological world view and the relevance and implications these may have for pedagogical practice in teacher education.

Background

There are, of course many dimensions to a study of this kind. As we consider ideas of nature and 'nature connectedness', we are aware that there are conflicting and contested views about these terms, a condition which is perhaps symptomatic of the difficulties associated with regulating, or educating around environmental issues and questions. Ives et al., (2017), for example, conclude that no systematic synthesis of literature exists and that "nature" is very often undefined. In their analysis of 475 publications on human-nature connections, the authors identified three main groups of studies: those that dealt with psychometric scales; those that looked at human-nature connections as experience, and those focusing on place, emphasising place attachment and reserve visitation. In a similar vein, Greaves (2016) observes that our way of looking at nature often involves drawing comparisons and oppositions between nature and

non-nature. Drawing on Hume (1978), he suggests that these are Nature as: opposed to *miracles;* opposed to what is *rare and unusual;* or opposed to *artifice.* It is not within the scope of this paper to deal with these definitions, or to try to reconcile all the differing dimensions. We will state that while we believe that humanity exists within nature, and is thus not separate from it, we also recognise that in the Western culture, understanding of nature has progressed through notable distinctions, for example between what can be considered natural and what is unnatural. By means of example, we mention here the production of artefacts through conscious and deliberate extraction and production of energy or materials, which would never otherwise be accessed on the current scale perpetrated by humanity. By contrast, a tendency to think of nature in material terms may lead to the idea that everything that is produced can be argued to be *natural¸* even a plastic spoon. However, such a viewpoint may overlook that both the quality and quantity of material transformations matter. As indicated by current studies investigating human appropriation of net primary production (Haberl, 1997), materials transformations are occurring beyond ecological norms (Haberl, Erb, & Krausmann, 2014), , resulting in rapid and unstable shifts in ecological systems[1], as well as widening inequalities between human groups.

Hence, against the background of a lively philosophical debate on the nature of nature and role of human agency (e.g. Bannon, 2016; Bonnett, 2004), this paper is principally concerned with how students *see themselves* with respect to "*nature*" as they see it. In order to pursue this focus, we adopt a pragmatic approach to the research process, one which both informs our practice and, we propose, contributes to the knowledge base in this area. Following the suggestions given by Brinkmann (2017), we should be aware of competing theorisations in this field, and actively engage with the wider cross-disciplinary turn to ontology (e.g. Ingold, 2011) as part of a long-standing debate across disciplines on the nature of knowledge and research practices (see Mauthner, 2015). Namely, we recognise that there are many stabilising aspects of "humanist" qualitative research which can contribute to the "posthumanist",

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[1] While accepting that humans are a part of nature and, therefore, by implication everything we do as humans must be "natural", a semantic focus on the meaning of the terms 'nature' and 'natural' may lead to potential problems, i). a situation of complacent acceptance and a 'do nothing' attitude, justified by the idea that all we do is 'natural'. ii). Diverting of attention away from the fact that activities conducted by a small part of humanity are deliberately and knowingly perpetrating damage on the planet. Even the speed of climate change is far greater than that ever produced by the other volcanic or solar activity that has caused previous climate change (IPCC, 2007). Thus focussing on human/nature does not necessarily imply a dualistic "humans outside nature" position, but rather that the impact of *some* humans is much greater than has ever been seen in the history of the planet. What we would argue is that new conceptualisations and new language are needed to engage in meaningful discourse around the human-nature nexus, some of which is already in development (e.g.(Braidotti, 2013; Cohen, 2013; Morton, 2007)

"postqualitative" research arena. Considering the pragmatist perspective, Brinkmann (2017), states that "Ontologically, Dewey would thus agree with the posthumanists, but in terms of advocacy he would side with the humanists" (p125). Such ontological premise also resonates with a view of learning as a process of growing awareness, which may be supported through transitions across apparent dichotomies, or as expressed by Dewey & Bentley (1949), as 'trans-actions', where there is no basic differentiation of subject and object; knowledge is more aptly understood as 'knowing', co-operative and flexible in character, and itself viewed as inquiry, not as an end-point, past or beyond inquiry. This point will be articulated further in the paper and the methodology as a peculiarity of this study.

Tracing the individual 'within' the environment: theoretical insights from the interdisciplinary literature

A useful starting point, in laying out the theoretical basis for the study, is offered by the review undertaken by Chawla (2007) on the importance of free play in childhood and the essential role performed by adults when they share an interest in nature with a child. The importance of socialization processes places emphasis on the significance of teachers in supporting and enabling children's exposure to the natural environment. Such a move however is not simply a matter of teaching style or planning choice, but it is rooted in the way in which teachers are being taught, reaching deeper into the epistemological and methodological foundations of teachers' personal identities as educators. Drawing on the work of ecological psychologists, particularly that of Eleanor Gibson (1969), James Gibson (1979) and Edward Reed (1996a, 1996b), Chawla (2007) examines a set of key features of an 'educational psychology' which encompass ideas of learning and are relevant to this study. More specifically; (a) humans are embedded in a web of life along with all other creatures on the planet; (b) knowledge is gained through direct experiences of our environment, not simply through mental representations and constructions; (c) living means first and foremost to be *animate*, moving; (d) through movement and entanglement in living systems people can be seen as part of a relational system; (e) the relationship between the organism and the environment is mediated through functionally significant properties of the environment termed, by Gibson (1979) as *affordances* (Chawla, 2007).

Chawla's theoretical pointers, and specifically, the third point, relating to movement, align with current developments in understanding of the role of the body in learning, and we are

principally interested in the interactions between body, mind[2] and environment, in what has been termed enactivism (Thompson, 2007; Varela, Thompson, & Rosch, 1993). Stemming from the work of Maturana & Varela (1987), enactivism as a mode of learning and knowing, is elaborated in Varela et al.'s (1993), *The Embodied Mind.*

Two key ideas, among others, central to enactivism, are the sensory-motor coupling between organism and environment (Thompson, 2007), and a view of knowledge that is not simply some internal representation in the brain of an external, pre-specified reality, but it is 'enacted' and brought forth as the result of the relational coupling of autonomous beings with their environment. It can be argued, therefore, that when applied to educational systems, enactivism stresses that reality and mind are interlinked and cannot be separated. As such, learning should not occur only as isolated events in a classroom, but it will always exceed any enclosed environment for it occurs through the process of bodily moving across spaces, time and places. Enactivism is, thus, a form of radical constructivism, a combination of constructivism with embodied cognition (Anderson, 2003; McNerney, 2011). Embodied cognition and enactivism are just two of a number of theoretical perspectives which may be brought together under the onto-epistemological category of socio-materiality (Mcphie & Clarke, 2015; Tanggaard, 2013). McPhie and Clarke (2015) in this respect talk about *the material turn* and argue for a view of environment as consisting not of phenomena such as plants, trees, humans, plastic bags etc. as *objects* or *subjects* that interact or relate to each other, but rather 'they are transient, enactive *physical processes* continuously taking place and always *becoming* as *intra* agencies' (p231). In a similar vein Gallagher and Lindgren (2015) explain that cognition, as enactive and embodied, does not take place, as traditional cognitivist views have it, 'in the head' as some form of symbolic representation of an external world, but is rather a dynamic set of interactions between brain and body and between body and environment. While individuals are autonomous autopoietic[3] systems, they are always 'structurally coupled' to their environment (Thompson, 2007) and 'structural coupling' refers to the history of recurrent interactions between two or more systems that leads to structural congruence between them (Maturana, 1975; Maturana & Varela, 1987, p.75). In other words, it is the interaction of body-brain-environment as inseparable units, thus the hyphens, which is central to cognition, to knowing. 'They produce

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[2] Mind is used in this article in the same non-dualistic sense as Dewey's "body-mind" (Johnson, 2006) but there is also a strong relationship between brain and mind, where a brain is a necessary, but not sufficient, requirement for mind, as mind extends beyond the brain and, while having biological dimensions, is a primarily social and contextual phenomenon - our cognition is not merely located in a brain in our head. For further discussion of this please see for example (Damasio, 2011; Johnson, 2017; Noë, 2009).

[3] Autopoiesis – refers to a system capable of maintaining and reproducing itself – living organisms are autopoietic systems.

each other, and thus are linked by a radical form of co-dependence' (Bocchi & Damiano 2013, p.123).

Such radical constructivist ideas lead us to the premise that knowing, or coming to know, cannot be effectively undertaken without considering these three elements together – body, brain and environment. The environment in which learning takes place is interrelated with the type of action and thinking that is conducted in that environment, and *such relationship is central to knowing*. So, addressing the purpose of this study, this paper is concerned with looking deeper into the process through which students 'are coming to know' about their own relationship with the natural world. We acknowledge that 'ideas of nature' and 'natural world' are framed differently by different disciplines; they are culturally contextualised, and notoriously difficult to define, as they change over time, depending on value frameworks and methodologies (Lamb, 1996). Hence, for the purpose of this study, we do not focus on definitions, nor on detailed exploration of the idea of human-nature (inter-)relationship or entanglement, but rather on the way in which students 'come to know' about themselves in relationship with their surroundings, by engaging the sensorial, affective and experiential dimensions of mind-body-environment experiences. In particular, we sought to focus on the 'kind of knowing' emerging from prolonged transitions across different settings, as is often the case in urban environments featuring a juxtaposition of highly urbanised areas, parklands or tended gardens. Different affordances may be possible, supporting equally different modalities of exploration of one's own body responses to the different contexts. On such a basis, the study adds to the existing literature in the field of outdoor learning by looking more closely at students' experiences across these areas of 'transition', and the learning potential which may be disclosed.

Context of the study

Outdoor learning has recently acquired a more visible profile in Scotland due to the introduction of a new school curriculum alongside a growing attention for education in out-of-school contexts (Scottish Executive, 2004; Scottish Government, 2017). However, while there may be exceptions, outdoor learning had never been part of the *core* elements of most University-based UK/Scottish teacher education programmes and many students would have had limited, or variable, prior experience of outdoor learning in school (Higgins, 2016; Mannion et al. 2007). Although individuals within a cohort will have had different experiences of nature many, if not most, will have had limited, or no experiences of outdoor learning pedagogies either as learners or as prospective teachers. As stated by Mannion, Mattu, &

Wilson, (2015) "we cannot claim to be providing a comprehensive, balanced or inclusive educational experience outdoors in Scotland" (p27).

In the Scottish curriculum document, *Building the Curriculum 3*, it states that 'Children and young people are entitled to a curriculum that includes a range of features at the different stages…" (Scottish Government, 2008, p11). Later picked up in, *Curriculum for Excellence through Outdoor Learning*, it states that this "…must include opportunities for a series of planned, quality outdoor learning experiences." ((Learning and Teaching Scotland, 2010, p9). Following this, two new, elective, modules in outdoor learning were developed under the overarching title of "Body, Mind and Nature: Outdoor Learning" and delivered over two semesters. The first semester module was considered to be "Foundations" and the second as "Extended". While they were linked modules, they were designed to be standalone electives with attendance on the first module providing a grounding for the second elective, and students enrolled on the first elective module being given preference for enrolment in the second module. However, participation in one module was not dependent on participation in the other. Both modules were launched for the first time in the academic year 2011-12, with a cohort of 33, first year undergraduate students enrolled in the four year Bachelor of Education Programme at a Scottish University, 30 female and 3 male, a similar distribution to the year population (110/F, 15/M). Over two-thirds of these students (24) were 17/18 year olds, 3 were 19 and 5 between the ages of 21 and 23 with one being a more mature student of 34 years. Three of the 33, were visiting Erasmus students from other countries in Europe; they were not included in the cohort study presented here. This paper focuses on data which was gathered from the cohort attending the first module 'Foundations'.

The module on which this study is focussed, was designed to introduce students to experiences of learning outdoors as broadly conceived, and to engage students in personal reflection on the learning processes that were generated. Students participated in a wide array of activities designed to build familiarity with being outdoors and to explore their own perceptions of the environment and how these are modified and changed 'in the open air' (Ingold, 2011), through the engagement of a range of bodily and sensorial stimulations. Thus the first module focused very much on the students' own experiences. For the purpose of initiating research in this area, all students were asked to provide informed consent to enable the authors to use their responses to questionnaires and materials produced during the modules. All students provided a positive response.

Setting

The University campus is located adjacent to one of the biggest arteries of the city with heavy traffic at all times of the day, but also within easy walking distance of naturalistic areas, such as an urban nature reserve, Victorian parks and University botanic gardens. Traffic noise permeates the setting. On the edge of the campus a neighbouring social housing estate; large, tarmac roads can be found alongside the small, cobbled streets, remnants of the older city. Within this setting, on the first day of the course, students were invited to take a walk around the campus and the local area and build a record of their walking "trails' (Ingold, 2011), posting commentary and photographs on on-line fora. On the second week, they were introduced to the process of sustained sensorial exploration to develop awareness of the role of the body in learning and the nature of knowledge which is gained through the senses, in the continuous responding and adjusting to the surroundings. Stimulating sensorial awareness is a means for recovering the sense of being physically, cognitively and emotionally 'wired up' within the environment; a phenomenological approach is evoked here to introduce the perspectival nature of the body-mind nexus, but also the importance of sensorial engagement in expanding the horizon of our being and problematising what is taken for granted within the conventional practice of knowing (Schutz & Luckmann, 1973). In this case, our concerns lay with the question of the self and how knowledge gained through sensorial awakening would bridge the dichotomy between observer and observed to promote a sense of 'affiliation with', and participation within the setting, looking at the emerging outline of an 'ecological' identity (Thomashow, 1996). We are at pains to specify that in this context, we are not simply concerned with students embracing green behaviours such as recycling or campaigning; rather, we are first and foremost preoccupied with their ability to gain awareness and experience of the ways in which their learning and perceptions are the result of body-mind-environment interactions and the impact of such experiences on their sense of self. While we recognise that fostering an ecological identity is linked in the literature to acquiring pro-environmental attitudes, this course did not set out to change students' values or behaviours, but to introduce students to asking questions about themselves within different environments. The act of learning through the course was thus a process that sought to stimulate the development of a way of being, grounded in lived experience, and which would underline the primacy of dialogue and relationships, an ethics of care and an ethics of responsibility (Gadotti, 2010; Mortari, 2003).

In this framework, two research questions were central to this study:

1. How do student teachers' sense of self within the environment change, if at all, during the course?

2. In what way can the development of an 'ecological identity' be described by students through co-participation and relational engagement with their own surroundings?

Methodology

The research undertaken was, in the first instance, primarily about informing practice. We were interested in what impact, if any, the course had on the students' *ecological identity*, their relationship with the natural world, as well as their reflections on the activities undertaken. We were interested in the body-mind-environment interactions and how this was perceived and articulated by the students. We thus adopted a pragmatist stance to the research process, "guided primarily by the researcher's desire to produce socially useful knowledge" (Feilzer, 2010, p.6). This involved a mixed method approach using both a quantitative survey questionnaire and a qualitative element primarily drawn from narrative research, as a means for understanding the role of the course in the development of pre-service teachers' understanding of their relationship with nature, and related epistemological conceptions. The type of narrative research described here would largely fall into Squire et al's (2008) second kind of *experience-centred* narrative research but might also, arguably, encompass elements of their third form of co-constructed narrative through the use of a discussion forum. However, as Squire et al. state, the definition of "narrative" is itself in dispute and "clear accounts of how to analyse the data…are rare" and "unlike other qualitative research perspectives, narrative research offers no overall rules about suitable materials or modes of investigation, or the best level at which to study stories" (p.1) so, arguably, quantitative data may also form part of the core of narration. In this paper, we focus on the narrations gathered during the first semester of the implementation of the course, drawing together data from both quantitative and qualitative sources. A further consideration with adopting a pragmatic approach is that such an approach aligns well with enactivist thought and method, the antecedents of enactivist thinking being found in the work of the pragmatic philosophies of Dewey, Peirce and Mead (Gallagher, 2009, 2014; Weichold, 2017).

So, the core premise of the course - and the research - was that through the concerted activation of experiential, reflective and intellectual dimensions students would be encouraged to actively engage with their own changing perceptions of the environment, and to take cognizance of the reflexive dimension of any learning process, which involves the subject in ongoing relationship with the context. According to Begg (2013), citing Davis et al. (1996), learning as an enactivist process is always in continuity with the body; it is not an object but an action of 'coming to know': the learner in relation to the learned, the knower and the known, the self and the other,

are all co-evolving and co-implicated. In order to support students' through this process, throughout the course experiential activities run alongside moments of personal reflection, group discussion, readings and personal writing that students were required to upload on a shared digital platform. Students were strongly encouraged to keep up with their on-line journal writing and the readings as a means of recording, organising, and sharing their reflections post-experience.

Design of the study

As an educational intervention, the course was designed to introduce students to new perspectives on knowledge and learning - and ultimately – to support new pedagogical practices in school. The study, therefore, was rooted in the assumption that the course would engage prior experiences of learning while at the same time stimulate the emergence of new understandings in the students. In this view, the study was designed to capture a sense of change, both by looking macroscopically across the 10 weeks of the first semester module and more closely at specific aspects of students' experiences as they unfolded week by week, and which they deemed to be significant.

Mixed-method approach

As discussed by (Author 1, 2008), the development of teachers' attitudes towards areas like environmental education is complex and understanding this is fraught with difficulties. They state: 'the real world is complex and stratified and …we continuously discover complex layers of reality that help us explain other layers' (p170), With this awareness, the study incorporated a mixed-method approach, which set out to provide, in the first instance, a sufficient level of understanding of the existing sets of conceptions, traced quantitatively, by drawing on the suggestions provided by the international research literature in environmental education (e.g. Ernst & Theimer 2011). Complementary to this, the qualitative strand aimed to explore, and describe further, in depth the experiences and bio-emotional responses of the students as they walked, and thus the dynamics of learning that had occurred. As mentioned, this research adopted a pragmatic approach designed to explore the impact of a course on students' attitudes, values and perspectives and, thus, to inform the course structure and delivery. Pragmatism aligns very well with enactivist ideas. Reid & Mgombelo, (2014) explain that enactivist research makes use of multiple perspectives, drawing on different theoretical positions and methods to widen the domain of possibilities. In the same way as cognition is enactive, so the research process should be seen as enactive in which the "researcher/re-searchers" are not pre-

given but enacted (Haskell, Linds, & Ippolito, 2002, p2), and this requires a "path of mindful, open-ended learning". In this study, therefore, we draw on both quantitative and qualitative methods in an open and exploratory way in order to open up the domain of possibilities that may emerge from students' narrations as "data".

Quantitative strand

Study participants

While there were two modules under the umbrella of "Body, Mind and Nature", this paper focuses on the results from the first semester module because; (a) it is centred upon the students' own experiences of and engagement with outdoor environments (whereas the second semester course focused more on pedagogies) and; (b) it offered the opportunity for linking a larger number of students who responded to the questionnaire to their narrative accounts during the module. Thirty-three students enrolled in the first semester course. However, only thirteen of these students completed both pre- and post- questionnaires in semester 1. While the sample numbers are small, the intention is not so much about generalising across a wider population, as it is exploring indicative results, which help to inform the more in-depth qualitative analysis, as well as providing a basis on which to build further research. This is in line with Anderson & Vingrys, (2001) who argue that small samples are not necessarily meant to quantify general performance but "…merely to document the existence of an effect, and so the number of subjects is less important" (p1411). Nevertheless, the sample does largely conform to the characteristics of a small sample as set out by Anderson and Vingrys and, while the *sample size* is small, the *effect* size (Coe, 2002) is moderate to large. In other words for this sample, the size of the effect seen is moderate to large and, on such basis, we felt it appropriate to include this data here to illustrate that a clear effect had indeed taken place. However, in order to be able to further understand aspects of that change, we focussed on the qualitative data provided by this smaller sample of students. Non-parametric statistics were used in the quantitative analysis. The scores on each of the scales is given in Table 1 and any statistically significant differences highlighted in Table 2.

Questionnaire design

The nature relatedness (NR) scale, used here, as proposed by Nisbet, Zelenski, & Murphy, (2009) describes individual levels of connectedness with the natural world. Not unlike the deep ecology concept of a self-construct that includes the natural world, the concept of NR as

described by Nisbet et al. encompasses one's appreciation for and understanding of our interconnectedness with all other living things on the earth[4].

The nature relatedness scale used in these studies consists of three factors:

- The NR-Self factor can be thought of as the ecological self, or how strongly people identify with the natural environment.
- The NR-Perspective factor is an indication of how one's personal relationship with the environment is manifested through attitude and behaviour and,
- The NR-Experience factor reflects the physical familiarity and attraction people have to nature.

Results from the quantitative strand

While this is an exploratory study with a relatively small group of students, the Cronbach's Alpha reliability coefficient for this small sample of students on the nature relatedness scale was, nevertheless, acceptable at 0.75.

The scoring used for the Nature Relatedness scale (Nisbet et al., 2009) is provided in Appendix 2. As can be seen in Table 1, the students exhibit an increase in their sense of nature relatedness over the course of the first semester. The increase in scores being consistent across all three factors of the nature relatedness scale, although only significant for the NR (Whole) and NR (Self) scores, the NR (Self) showing the largest increase from pre-to post questionnaire.

INSERT TABLE 1 HERE

The increase in the scores are, in most cases, statistically significant and, therefore, not just attributable to chance. The results using the Related Samples Wilcoxon Signed Rank Test are provided in Table 2.

INSERT TABLE 2 HERE: STATISTICAL DIFFERENCES

The results of the quantitative analysis suggest that there was a statistically significant impact on the students' ecological identity, possibly attributable to the design of the course. Although the number of respondents who completed both the pre- and post-questionnaires is small (13 of 33), in all but one of those cases there was a clear increase in their NR scores. This does give a strong indication of a serial effect, although the one exception also suggests that further study

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[4] We are aware that critiques can be raised about the design of the scale which is based on contrasting categories, which may sharpen dichotomical views of human-nature relationships. Such dilemma was addressed earlier in the paper (p.5). The use of the scale in this paper is justified on the basis of this being one method and thus one way of understanding the students' learning process, included as part of a dynamic and holistic interpretation of the students' more extended and expansive learning journey during the course.

is required with larger samples (Anderson & Vingrys, 2001; Author 1 *in press*). The effect size for this sample was also moderate to large with a Cohen's *d* of 0.73. So, taken in conjunction with the significance of the Wilcoxon sign ranked test, it certainly appears that there has been an effect over the period of the module, although the quantitative measure does not provide any further indication of how this effect is manifested or perceived by the students themselves. Hence the need for the more qualitative aspect to this study.

It is also interesting to note that the significant difference in the students' NR score was largely attributable to the NRSelf factor. In other words the possibility is that the students had been impacted on to a sufficient degree by their experiences on the course to begin to relate to nature as part of their identity, their ecological identity. However, while the experiences had perhaps been sufficient to impact on them in this way, their attitudes toward the environment, or environmental concern, as well as their feelings of comfort in the natural environment, while they had increased, had not shifted significantly. This is not surprising, given the complexity of such phenomena, and is to some degree reflected, and amenable to further reflection, in the qualitative analysis.

Qualitative strand

The qualitative strand of the data collection aimed to understand the relational, epistemological and pedagogical features of the students' emerging identities during the course. Data consisted of a set of 89 reflective comments posted on a weekly basis, over 10 weeks, on the course discussion board by the group of thirteen case study students. While the overall number of posts uploaded by the entire cohort of students was much larger (221), the qualitative analysis focussed on the data collected from the thirteen students who had completed both the pre- and post-semester questionnaires and had been regularly uploading, on the web platform, their reflections on the experiential activities they had encountered throughout the course.

Using NVivo, a grounded theory approach was adopted for the analysis of the qualitative data. 11 codes were derived and these, along with the frequency of occurrence, are given in Table 3, elaboration of the codes and examples are provided in the analysis which follows.

INSERT TABLE 3 HERE

Before progressing, it is helpful to note that the use of the term coding here might be better understood as a pragmatic device to illuminate aspects of shared human experience emerging from the narratives produced by the students (Schutz & Luckmann, 1973). Codes were not predetermined and were not used as some means to fragment the stories. In fact, what is important is not the individual elements but the reading of all these elements together into a

unified whole, which is possible through the experiences of the researchers themselves, who were also participants in the experiences being related by the students, thus aligning with enactivist thought (Haskell et al., 2002; Reid & Mgombelo, 2014). The authors/researchers were not outsiders looking objectively on but were active participants in the unfolding actions. So, while there may be some objections to the term, and the use of, coding, in this form of narrative research, Brinkmann, (2017), drawing on Maclure, (2013) suggests it can in fact be retained, "albeit by understanding it in a different way…Thus, even if there are inherent ontolqgical problems in the practice of coding from a postqualitative perspective, it may nonetheless be a technique that can spark wonder and creativity in the analyst" (p118).

In addition, it is important to note here that many of the statements were open to dual *coding*, for example when students were expressing concern about noticing risk while walking along a cobbled path. Dual coding disclosed a perception of unease and novelty about walking on old roads (as opposed to driving or strolling on smoother and modern paved areas) *together with* the awareness that their ambulation changed, and what such change entailed for the way in which they related with their surroundings (i.e. the possibility to go slower and to notice). Such entangled expressions are a reflection of the way in which we experience phenomena and thus necessitating an approach to analysis much closer to interpretation, a process which is quite different to the numerical or verbal fragmentation used in reductive, scientific, approaches.

Understanding students' experiences: walking 'as learning'

Unlike many other formal education contexts, where much of the time is spent rather passively sitting and listening, the course was a highly ambulatory one with students spending as much as two out of the three hour sessions walking and actively moving around. It is perhaps then no surprise that the students frequently mention this, but, as we will see, by recognising that walking is an important part of the learning process (names have been changed):

> *'Normally people walk somewhere for a purpose and miss out what there actually is to see'.* (*Lisa*)

> *'I was amazed when doing the exercise at how many of the places I either never knew existed or never bothered to stop and think about them'.* (*Lucy*)

Adopting the lenses of enactivist theories we can observe how students' walking allows for learning not as a process of linear accumulation of 'new' information, as additional or alien to what might have been seen or encountered before, but through openness to what had not been 'noticed' and thus, 'come to their awareness' before. Hence learning as walking seem to

proceed by affiliation with past experiences and, notably, the way one walks affects what is being noticed and/or experienced.

In so doing, students also grappled with their own physical experience by recognising potential hazards associated with walking, as well as pleasurable, aesthetic sensations:

> *Uneven surfaces with tree roots and rocks. These were camouflaged making it easier for people to trip/fall.... wet leaves making it unsafe to walk on' (Carrie)*
> *It was a beautiful day and the walk was at once peaceful and active. (Alana)*

Affective and aesthetic responses

The affective responses were the most frequent comments made on the discussion fora. These were often associated with aesthetic involvements, bringing up a range of different feelings, such as peacefulness, expressions of surprise, or apprehension in unfamiliar circumstances:

> *'It was a pleasant surprise for me to find such a peaceful space…' (Lucy)*
> *'I have never properly looked at the beautiful scenery' (Lisa)*
> *'The atmosphere was very calm, with hardly anyone around - the dampness of the air gave it an almost sad atmosphere…' (Alana)*
> *'...the speed of the cars approaching, this made me feel on edge…' (Carrie)*

Notably, feelings of discovery are associated with apprehension towards entering gardens and woodland areas, even though they were in close proximity of campus (or integral parts of the University grounds):

> *'I was slightly apprehensive whilst walking through the Botanic Gardens…' (Carrie)*
> *'I found some of the areas brought up feelings: I generally find wooded areas a little scary, but once I entered, it was calming…' (Alana)*
> *'It felt very peaceful and quiet... I found the area very attractive' (Carrie)*

Students' embodied responses quite clearly pointed to significant aspects of formative learning experiences as they illustrate the cognitive and emotional impacts of walking, exploring new places and sensing the environment in its complex being. We also note students expressing a range of different emotional states, from calmness to edginess, as their bodies respond to a variety of stimuli which may be simply, or naturally, 'taken for granted' (e.g. birds chirping vs. rumbling engines).

Realisations and awakenings

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It was apparent from a number of statements made by the students that they grappled with shifting perceptions and levels of awareness. Immediately after the first walk on campus, in the first week of the course, the students made comments about the 'newness' of such a way of learning and commented on the fact they 'had never been properly looking':

> *'It wasn't until I took part in the weekly outings and my case study ... that I realised the positive impact nature can have on a child's learning experiences...'(Carrie)*
> *'It really opened my eyes to the area and also to the many areas of the curriculum and how many of them link together well' (Alana)*
> *'The walk we undertook this week was an eye opening one' (Aida)*

Noticing

Perhaps strongly linked to the previous category of realisations and awakenings, is the skill of noticing. The students often expressed the idea of 'having noticed' things that they previously had not appreciated, 'taking in' sounds and textures, both as sensorial and deliberate acts of noticing and verbalising accordingly:

> *'...it occurred to me that we never really take a look at the nature that is around us until we have to' (Lisa)*
> *'Out of the blue, I could hear birds twittering, leaves rustling and grass squelching under my shoes.' (Ellie)*
> *'My ears took in the sounds around me: birds chirping, the rustling of leaves, the sound of the water in the small pond, the squeak of the wet grass and the distant traffic.' (Alana)*
> *'We walked around and found real risks such as tripping hazards, water hazards, slipping hazards and plant hazards such as stings.' (Keara)*

Interestingly, such noticing appeared to awaken parts of themselves, as modes of looking, that had lain dormant for some time:

> *'I don't think we appreciate our sense enough. We always use our sight to see, but we don't always think about what we smell, or taste, or the feeling under our feet' (Lara)*
> *'I found it interesting looking at the objects/ sounds etc. in more detail as it allowed me to pick up on things I have never taken much notice of before.' (Carrie)*
> *'…things that I would never care about on a day-to-day basis came to the forefront of my mind. I began to ask myself 'What If?' (Jodie)*

As opposed to simply 'viewing' nature as an abstract concept, here we can begin to appreciate how students' comments point to a more granular understanding of the entangled nature of materials, the physical layout, and their own presence in the making of the experience.

Pedagogy and learning

It is perhaps not surprising that, as mainly education students, the discussion posts made frequent references to pedagogical aspects but they also made reference to the students' own learning and how these were formative experiences in their thinking about future pedagogies.

> *'Children have to reflect about their lives and this kind of activity helps to understand better who we are...' (Paige)*
>
> *'As teachers, we can use this activity to promote self-learning, so that exercise is regulated by children, with their own decisions and their reflections.'(Paige)*
>
> *'Throughout this course I have discovered a lot about the environment and realised how beneficial it can be for children of all ages to take part in' (Lara)*
>
> *'I think that journey sticks are a great way to get children involved outdoors. It makes them really engage with the environment and get creative.' (Reese)*

Connections

In some cases, the activities allowed them to make connections between apparently unrelated aspects of the curriculum;

> *'...it made us think how each of the subjects were related to one another....' (Lara)*
>
> *'If we want to be a good teacher, we have to look at the world not only carefully but globally' (Paige)*

In other cases, it was a personal connection that they made with their own backgrounds:

> *When we're walking through [the] Park I took a lot of pictures that reminded me of some life experiences and others that are significant for me here. (Paige)*

As well as the entanglements between humans and non-human activities, through the physical manipulation of materials and transformation of the natural world:

> *'I enjoyed collecting different materials to make land art as it allowed me to connect to the environment.' (Carrie)*

'It made me think about how we can be in the middle of a city yet have nature around us' (*Lisa*).

Weather

Perhaps unsurprisingly due to the northerly geographical setting, weather appeared in many of the students' posts, yet with a recognition of the weather as a central element in the nature of the experience; the weather was profoundly connected both with the materials and the sensations and emotions evoked at the time:

'I do believe that this would have been a very different walk if the weather were to have been bad' (Lisa)

'But I feel that all of these feelings may have felt different if it wasn't such a lovely day!' (Aida)

'I was surprised by the drop in the temperature' (*Ellie*);

Childhood reflections

Perhaps what is also of significance is the way in which many of the students reflected, unprompted, on their own childhood experiences. Such comments were suggestive of something that had been lost, or submerged, over a period of time.

The nature-loving child within me was unleashed and I instantly felt more adventurous wanting to explore more and more (Jodie)

The beach always reminds me of going to my Granny's as a child (Cilla)

Beyond an initial sense of nostalgia, there was also a desire to regain a valuable part of themselves, in re-connecting themselves, with natural settings and childhood:

I have not done anything like this since I was a child exploring the woods around my house and it made me realise we are never too old to connect with nature and have fun outdoors (Lucy)

Relationships and groups

The context and environment within which the course took place encouraged not only the relationships and working within groups of students on the course, but also appeared to encourage students in taking their experiences and sharing them with other students outside of the course.

'I have already told my flatmates I am taking them on the walk because I want to share the experience with them' (Jodie)

'...it was good that we went straight on a walk the first day as it allowed us to mix with the other students in the class' (Lara)

'I found that working in groups made it easier as we were able to listen to each other's ideas and get inspiration from them to come up with other suggestions.' (Lisa)

Imagination and creativity

Throughout the course the students were encouraged to 'think outside the box', to enable them to see things in different ways and also to make links with pedagogical practices. The destabilising and defamiliarising aspect of creative activities is an important element of the course, as discussed later.

'I think the activity encourages children to get involved and to learn in a more creative and interactive way' (Cilla)

'Furthermore I never realised what could be created using the materials we found and it was a great exercise to be creative' (Lisa)

'Like many other people I do not count myself as particularly artistic or creative. However, I really enjoyed this task and was proud of what we achieved using natural objects.' (Lucy)

Environmental Concerns

As indicated earlier, the course was concerned with supporting students' sense of connectedness with the natural world, as this was essential in encouraging them to embark on pedagogical practice and reflection, coupling children's education with planetary concerns. As we saw from previous comments, the processes of 'noticing' and 'realisation and awakening' are central aspects of students' personal development:

'...after walking through a nature reserve made me realise how much we are damaging the environment.' (Aida)

When you step out of your own boots and try putting on someone else's, you become instantly more aware of the environment around you (Jodie)

'In my opinion, thinking about your environment is an important part of our learning in the school.' (Paige)

Discussion

This study set out to evidence and describe the potential for 'movement' in student teachers' development of a relational sense of self with respect to their environment, a sense of

interdependence or, as Nhất Hạnh (2000) might put it 'inter-being'. It was clear, with the caveats mentioned earlier, that the results of the quantitative measures of nature relatedness gave an indication that there was a significant shift in the students' sense of self within the environment, towards a greater sense of relatedness to nature. However, it is only through close examination of the qualitative data that we begin to see in what way this shift was manifesting itself.

From the analysis of students' posts, two aspects of the course appeared of greater importance. The first was the act of walking, which is common for students when getting from point A to point B (from the students' halls to the lecture hall) and yet rarely undertaken as part of academic study! Secondly, the act of walking was accompanied by deliberate acts of engagement with the environment designed to stimulate greater sensory awareness, and to relate to the environment in different ways e.g. through art-making, sensory mapping, collecting and handling natural objects etc. Excerpts from students' narratives indicate that walking and physical engagements with the materiality of places can open up participants' eyes to the qualities of their environment, challenging pre-existing categories as they come to 'see' things in a different way. The embodied nature of perception was also visible through the students' language as they made use of words related to observing, which had multiple connotations and potential for learning, as we discuss further below.

Travelling vs. Walking or Seeing versus Noticing: students' experiences on the course.
Here the idea of observing as an aesthetic and bodily experience is counter opposed to the simpler act of 'seeing' as in passing by. Walking as a means of knowing involves a change or adjustment of one's pace, in order to establish a relationship with the surroundings - physiologically - by using the senses, seeing, balancing, and hearing and at the same time attending to one's body in action. Indeed, students point to the 'riskiness' of walking even if paradoxically, it is an activity which is profoundly and characteristically human. It is in this process, however, that, according to Christie (2013), lies one of the most important educational lessons for humans; to cultivate a habit of regard, through vigilance, attention, and discernment. Such attitude of watchfulness is a very real, physical, and material practice which carries contemplative features, with the potential of bringing forth a change of perspective on the world that was taken for granted. As Ingold (2011) states, '*locomotion, not cognition, must be the starting point for the study of perceptual activity…walking itself is a form of circumambulatory knowing'* (p46). Furthermore, an important dimension of such a perceptual shift associated with walking is also related to the change from the high power, concentrated energy, of fossil-

fuelled, technological locomotion, to the low power, distributed energy of ambulatory locomotion. At a low power scale, potholes can be risky; the busy road with cars can be frightening and more dangerous than they might have been perceived to be otherwise; the weather may surprise you ("*…the drop in the temperature*", *Ellie*), and calls for greater attention to the body's states and sensations. In the data, the students describe the change of bio-physical perspective, from the high power, technological, to the low power, pedestrian position, which brings reality back to a human scale, for which we can account and be accountable for. At a low powered level, it is also possible to expand the scope of one's perception beyond what is commonly perceived - or what we are allowed and directed to perceive.

Since the very beginning of the course students appeared to recognise that a change was taking place in their ways of being as they were encouraged to accommodate a new range of sensorial stimulations, extending the opportunities to see themselves differently as they viewed the world differently. We can see here resonances with Payne and Wattchow's, (2009) slow pedagogy, which highlights "a shift in emphasis from focusing primarily on the "learning mind" to re-engaging the active, perceiving, and sensuous corporeality of the body with other bodies (human and more-than-human) in making-meaning" (p16). In relation to our particular research question, we can also appreciate the emerging features of an ecological identity, pointing to an expanding sense of oneself as a form of accommodating and preparing for what is yet to come.

A strong theme emerging from the students' approach to walking was the awakening of their aesthetic perception and the sensations that were generated. We can recognise the sense of first-hand discovery of something that has been noticed and appreciated, as if for the first time. Indeed, in this local mode of knowing the experience of sound is being acknowledged. For example, a 'quiet' environment is not simply, and necessarily, a lack of sound, but it is related to frequency (e.g. bird chirping or leaves rustling) as well as with a regained sense of familiarity with earlier childhood experiences. Sound as a material manifestation is being recognised cerebrally, yet provoking intra-actions (McPhie and Clarke, 2015) enabling students to affectively connect their current experiences with their past, and with a place that is new to them. Hence students' comments bring forth a clear sense of 'coupling' with the environment, recognising feelings of well-being and relaxation, as well as gradual venturing into unfamiliar spaces. The emotional aspect of students' learning brings to surface an awareness of the 'human condition' and how it is inextricably linked and connected to the 'environmental condition', of

how places can affect us both consciously and subconsciously. This echoes Casey's (2001) idea of constitutive co-ingredient of place and human identity, and reflexivity, as complex intra-action (Barad, 2007). It is particularly interesting to observe how students aimed to describe such processes of internal, emotional re-adjustment, for example through their awareness of boundaries and the experience of 'crossing' them, which surfaced on different occasions.

Crossing boundaries: ecological identity and the development of an educational stance
'Crossing' is a layered theme, encompassing several levels of students' consciousness. In the first instance, we find the boundaries between different, adjacent environments. Through walking, students recognise that the habitually perceived Nature/Culture divide - often symbolised by means of contrasting the city or built environment with green spaces or natural environments - is largely artificial. There are co-penetrations. By means of walking and by taking the 'low energy position' they become exposed to a landscape of possibilities: if transport by car is heavily constrained by tarmac roads; walking enables one to become aware, and to appreciate, that lines of demarcation can be lines of power as well as lines of continuity and adjacency. As indicated by Nazir and Pedretti (2015), this realisation can form the premises for a reconsideration of the environment as a place of co-construction, involving many people and more-than-human communities and factors. Such realisation points to an epistemological shift, for the world is not just 'there', abstract and fixed as given, but it encompasses one's own, internal, mode of knowing and seeing the world. Students' narratives point to the ambiguities and challenges of binary distinctions, living and non-living, natural and man-made: *"Out of the blue, I could hear birds twittering…"* (*Ellie*). Some students also stretched from the physical dimension to the anthropological and sociological dimension to recognise that humans are themselves systemic entities, who are enmeshed in the web of time, space and relations: *"things that I would never care about on a day to day basis came to the front of my mind. I began to ask myself 'What if?'* (*Jodie*)

More importantly, and as it was pointed out earlier, such realisations can have powerful socio-political repercussions. Crossing boundaries - both in time and space – is an act of personal growth, which is both culturally and socially mediated, for example, by family norms and customs. While the students talk about risks for children, it is apparent that psychologically handling the inside/outside boundary requires both individual and collective agency. It may be argued that societies and cultures, with a heavy focus on the individual, would associate risk and danger with the outside, the unknown 'other', the foreigner or stranger, in opposition to

the supposed safety of the internal, indoor spaces. For example, this widely held perception is at odds with available data which shows that more accidents and accidental deaths, actually happen in the home than anywhere else, or that the majority of crimes involving children are often connected to people that are close to the family (RoSPA, 2017).

Hence, the apparent sense of closure seems to pair up with the recognition of one's own psychological closure and more broadly, a sense of collective acceptance of common assumptions. By contrast, engagement with boundaries and their material rearrangement is an act of creativity and purpose. Arguably, the students' comments are pointing to a further feature of an emerging ecological identity, which appeared to include social elements..The effect is small but notable considering the relatively short time students spent on the course in the overall timetable. For example, it was possible to observe how, throughout the course, the physical experiences of walking and interacting with materials supported a change of perspective related to oneself in connection with other people and places, a sense of openness and creativity:"*…I am taking them on the walk because I want to share the experience…* (*Jodie*). It is also interesting to observe how students 'open up' to the world and the realm of the possible, as they come to valuing other people's skills and abilities, taste and ideas: *"I never realised what could be created using the materials we found…"* (*Lisa*).

These findings are in line with current ideas of environmental identity as put forward by Williams & Chawla (2016) drawing together insights from Thomashow (1996) and Clayton (2012), to emphasise direct, and embodied encounters with places, but also current understanding of affect as socio-spatially mediated, aligning individuals with communities, body-spaces with social spaces (Ahmed, 2004; McPhee and Clark, 2015). Hence, far from being simply an individualised, cognitive feature, or even a luxury as it has been historically afforded by the few (Greaves, 2016), the sense of nature connectedness brings communities into view, and so the possibility to revisit ways of inhabiting a shared environment.

Being part of the environment

Such findings and considerations from students about movement, noticing and making things, provide strong arguments for taking learning out of the classroom and for it to become ambulatory and sensory. Similar comments from the students about heightened sensory awareness and aesthetic appreciation also mirror Ruitenberg's (2012) observations, 'the walks offered *aesthetic* education as they prompted participants to see, hear, smell and feel what is around them in the city they live in but often move through without really noticing' (p266). Masschelein (2010) talks about education with respect to e-ducating the gaze. He makes the distinction between 'educare' (teaching) and 'e-ducere' as leading out. In this respect e-

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ducating the gaze is 'not about becoming *conscious* or *aware,* but about becoming attentive, about paying *attention*' (p.44), in ways which can be liberating as students acquire a method for diverging from given categories, cultural (as well as physical) pathways and value-assumptions. However, while our study provides some evidence that the experiences of our students had an impact on their relational self, is there sufficient evidence that the activities could alter their relational position towards the role of the natural systems more generally?

The students' reflections point to a greater sense of body and sensorial awareness, which were linked to the emotional dimension but also to conceptual understanding, as students combine the ability to discern - an important analytical feature commonly associated with scientific thinking – with a sense of carefulness and regard. So, the consciousness of the body and heightened sensory awareness seemed to impact on the relational aspects at the basis of the sense of connectedness with nature, *being a part of* rather than just *in* the environment. More specifically, a question which remains unanswered is whether experiences of this kind can form the basis for enhanced value systems' appraisal, thus forming the basis for understanding different modes of living, being with others, and inhabiting the Earth.

Encouragingly, evident within the students' commentaries, is a realisation of the necessity to be flexible and adapt to an emerging curriculum, rather than relying on a pre-given one (Osberg & Biesta, 2008; Ross & Mannion, 2012). As one student commented: "*this kind of activity helps us understand better who we are*"(*Paige*). Learning 'outdoors' or in the 'open air' is indeed a process of coupling, and coming to know oneself within the environment, and which requires to be embraced and supported through unfolding educational experiences. Such evidence provides grounds for the argument in reconceptualising teacher education. One which recognises the value and power of embodied learning, that is enactive and requires movement between spaces and across boundaries that awakens the senses. We need a teacher education that not only acknowledges, but practices, a learning that is not premised on a brain inside a skull but recognises that "we are involved with the world around us. We are in it and of it" (Noë, 2009, p82)

That said, there are many fewer statements in students' narratives referring to connections, relationships, and environmental concerns. More longitudinal and multi-sited research, and associated practice therefore, is required to examine the nuanced influence of outdoor experiences on students' developing ecological identity, and their ability to grapple with the material, ethical and politicised nature of humans' actions in the environment.

Conclusion

This study was concerned with the impact of an experiential course on outdoor learning on students' perceptions of their relationship with, and awareness of, the natural world, and how such early experiences could influence their ideas of pedagogy. While the numbers are relatively small and the results are tentative there is, nevertheless, evidence that the students' experiences outdoors enhanced their sense of connectedness and their awareness of affordances offered by those environments. It also aligns with and supports the idea of enactivism, or the interconnectedness of the body, brain and environment in cognition. The key feature of the course, however, is the destabilising and defamiliarising nature of the experiential activities that were undertaken. In this, it is important to put students in a position which shifts them from their usual way of looking at the world, to awaken their senses to new ways of perceiving. What Masschelein (2010) might say as '*displacing one's gaze so that one can see differently*' (p45); this defamiliarisation may be the beginning of a transformative experience.

We argue that, in order to re-orientate education towards sustainability (Gadotti, 2010) we need to reconsider how we understand children's learning, starting from experiences in nature and laying the foundation for an ethical position towards the Earth. The findings reported in this paper support the value of a form of education, which enables people to shift into seeing things in a way which reviews and renews common understanding of everyday experiences, and events which have become so familiar that our perception of them has become routine (van Boeckel, 2013). In this regard, this paper makes a contribution to the field of teacher education and in education more generally, by reinstating the basis for educating teachers in formal contexts in ways that promote creativity, grounded within the biophysical constraints of the Earth. Such a view also aligns very well with the idea of the Biophilic University proposed by Jones (2013) which he describes as a 'university which restores an emotional affinity with the natural environment' (p148). In doing so, we need to acknowledge that the body, mind and environment are intricately connected and we can no longer pursue an education either based on cognition as computational process located largely in the brain, or as a social construct operated by humans. Rather, as Begg (2013) states '*cognition depends on the kinds of awareness that come from having a body with various sensorimotor capacities*' (p83). … a living organism (person, plant, animal) and their environment need to be considered together, one cannot separate knowing from doing and from the body, and that knowing is doing, which in the end is inseparable from self-identity or being. Similarly Gallagher & Lindgren (2015) refer to the metaphor offered by Varela, derived from the poet Machado, of 'laying down a path in walking' to capture the sense of enactive cognition. They state '*the path (or our understanding) is not pre-established; we construct it as we go specifically through bodily*

processes, such as walking, moving, gesturing, reaching, grasping and interacting with others'
(Gallagher and Lindgren, 2015, p393).

Wanderer, the road is your
footsteps, nothing else;
wanderer, there is no path,
you lay down a path in walking.

In walking, you lay down a path
and when turning around
you see the road you'll
never step on again.
Wanderer, path there is none,
only tracks on the ocean foam.

~Antonio Machado

References

Ahmed, S. (2004). *The cultural politics of emotion.* Edinburgh: Edinburgh University Press.

Anderson, A. J., & Vingrys, A. J. (2001). Small samples: Does size matter? *Investigative Ophthalmology & Visual Science*, *42*(7), 60–1413.

Anderson, M. L. (2003). Embodied Cognition: A field guide. *Artificial Intelligence*, *149*(1), 91–130. http://doi.org/10.1016/S0004-3702(03)00054-7

Bannon, B. E. (2016). *Nature and experience : phenomenology and the environment*. (B. E. Bannon, Ed.). London: Rowman & Littlefield.

Barad, K. (2007). *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Duke University Press.

Begg, A. (2013). Interpreting enactivism for learning and teaching. *Education Sciences & Society*, *4*(1), 81–96.

Bocchi, G., & Damiano, L. (2013). The Enactive Mind An Epistemological Framework for Radically Embodied Didactics. *Education Sciences and Society*, *4*(1), 113–134.

Bonnett, M. (2004). *Retrieving nature : education for a post-humanist age*. Blackwell.

Braidotti, R. (2013). *The posthuman*. Cambridge: Polity Press.

Brinkmann, S. (2017). Humanism after posthumanism: or qualitative psychology after the "posts." *Qualitative Research in Psychology*, *14*(2), 109–130. http://doi.org/10.1080/14780887.2017.1282568

Casey, E. S. (2001). Geography and Philosophy: What Does I t Mean t o Be i n t he Place-World? *Annals of the Association of American Geographers*, *91*(4), 683–693.

Chawla, L. (2007). Childhood Experiences Associated with Care for the Natural World : A Theoretical Framework for Empirical Results. *Children Youth and Environments*, *17*(4), 144–170.

Christie, B., Beames, S., & Higgins, P. (2016). Context, culture and critical thinking: Scottish secondary school teachers' and pupils' experiences of outdoor learning. *British Educational Research Journal*, *42*(3), 417–437. http://doi.org/10.1002/berj.3213

Christie, D. E. (2013). *The Blue Sapphire of the Mind*. Oxford University Press. http://doi.org/10.1093/acprof:oso/9780199812325.001.0001

Clayton, S. D. (2012). Environment and Identity. In S. Clayton (Ed.), *The Oxford Handbook of Environmental and Conservation Psychology*. (pp. 164–180). New York: Oxford University Press.

Coe, R. (2002). It's the effect size, stupid: what effect size is and why it is important. Retrieved from https://www.leeds.ac.uk/educol/documents/00002182.htm

Cohen, J. J. (2013). *Prismatic ecology : ecotheory beyond green*. Minnesota: University of Minnesota Press.

Damasio, A. R. (2011). *Self comes to mind : constructing the conscious brain*. London: Random House.

Davis, A. B., Sumara, D. J., & Kieren, T. E. (1996). Cognition, co-emergence, curriculum. *Journal of Curriculum Studies*, *28*(2), 151–169. http://doi.org/10.1080/0022027980280203

DeLuca, K. M. (2005). Thinking with Heidegger: Rethinking Environmental Theory and Practice. *Ethics & the Environment*, *10*(1), 67–87.

Dewey, J., & Bentley, A. F. (1949). *KNOWING AND THE KNOWN*. Boston: The Beacon Press. Retrieved from http://www.aier.org/sites/default/files/Files/Documents/Standard/KnowingKnownFullText.pdf

Ernst, J., & Theimer, S. (2011). Evaluating the effects of environmental education programming on connectedness to nature. *Environmental Education Research*, *17*(January 2013), 577–598. http://doi.org/10.1080/13504622.2011.565119

Feilzer, M. Y. (2010). Doing Mixed Methods Research Pragmatically: Implications for the Rediscovery of Pragmatism as a Research Paradigm. *Journal of Mixed Methods Research*, *4*(1), 6–16. http://doi.org/10.1177/1558689809349691

Gadotti, M. (2010). Reorienting Education Practices towards Sustainability. *Journal of Education for Sustainable Development*, *4*(2), 203–211. http://doi.org/10.1177/097340821000400207

Gallagher, S. (2009). Philosophical Antecedents of Situated Cognition. In P. Robbins & M. Aydede (Eds.), *Cambridge Handbook of Situated Cognition* (pp. 35–52). Cambridge: Cambridge University Press.

Gallagher, S. (2014). Pragmatic Interventions into Enactive and Extended Conceptions of Cognition. *Philosophical Issues*, *24*(Extended Knowledge), 110–126. http://doi.org/10.1111/phis.12027

Gallagher, S., & Lindgren, R. (2015). Enactive Metaphors: Learning Through Full-Body Engagement. *Educational Psychology Review*, *27*, 391–404. http://doi.org/10.1007/s10648-015-9327-1

Gibson, E. J. (1969). *Principles of perceptual learning and development*. Prentice-Hall.

Gibson, J. J. (James J. (1979). *The ecological approach to visual perception*. Houghton Mifflin.

Greaves, T. (2016). Natural Phenomena. The Birth and Growth of Experience. In B. E. Bannon (Ed.), *Nature and Experience. Phenomenology and the Environment* (pp. 31–42). Oxford: Oxford University Press.

Haberl, H. (1997). Human Appropriation of Net Primary Production as An Environmental Indicator: Implications for Sustainable Development. *Ambio*, *26*(3), 143–146. Retrieved from http://www.jstor.org/stable/4314572

Haberl, H., Erb, K.-H., & Krausmann, F. (2014). Human Appropriation of Net Primary Production: Patterns, Trends, and Planetary Boundaries. *Annual Review of Environment and Resources*, *39*, 363–91. http://doi.org/10.1146/annurev-environ-121912-094620

Haskell, J. G., Linds, W., & Ippolito, J. (2002). Opening spaces of possibility: The enactive as a qualitative research approach. *Forum Qualitative Sozialforschung*, *3*(3).

Higgins, P. (2016). *Outdoor Learning in Scotland: Issues for Education. Moray House School of Education Election Briefings*. Retrieved from www.ed.ac.uk/education

Hume, D. (1978). *A Treatise of Human Nature*. Oxford: Oxford University Press.

Ingold, T. (2011). *Being Alive: Essays on Movement, Knowledge and Description*. *Social Anthropology*. http://doi.org/10.4324/9780203818336

IPCC. (2007). Is the Current Climate Change Unusual Compared to Earlier Changes in Earth's History? Retrieved April 18, 2018, from https://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-6-2.html

Ives, C. D., Giusti, M., Fischer, J., Abson, D. J., Klaniecki, K., Dorninger, C., … Solecki, W. D. (2017). Human–nature connection: a multidisciplinary review. *Current Opinion in Environmental Sustainability*, 26–27. http://doi.org/10.1016/j.cosust.2017.05.005

Johnson, M. (2006). Mind incarnate: From Dewey to Damasio. *American Academy of Arts & Sciences*, *Summer*, 46–54. http://doi.org/10.2307/20028051

Johnson, M. (2017). *Embodied mind, meaning, and reason : how our bodies give rise to understanding*. Chicago and London: University of Chicago Press.

Jones, D. R. (2013). "The biophilic university": A de-familiarizing organizational metaphor for ecological sustainability? *Journal of Cleaner Production*, *48*, 148–165. http://doi.org/10.1016/j.jclepro.2013.02.019

Lamb, K. L. (1996). The problem of defining nature first: A philosophical critique of environmental ethics. *Social Science Journal*, *3*, 475–486.

Learning and Teaching Scotland. (2010). *Curriculum for Excellence through Outdoor Learning.* Retrieved from https://education.gov.scot/Documents/cfe-through-outdoor-learning.pdf

Maclure, M. (2013). "Classification or wonder? Coding as an analytic practice in qualitative research". In R. Ringrose & J. Coleman (Eds.), *Deleuze and research methodologies.* (p. 164–83.). Edinburgh: Edingburgh University Press.

Mannion, G., Doyle, L., Sankey, K., Mattu, L., & Wilson, M. (2007). Young People's Interaction with Natural Heritage through Outdoor Learning. *Heritage*, *225*(225), 118. Retrieved from http://eprints.gla.ac.uk/50045/

Mannion, Mattu, & Wilson. (2015). SNH Commissioned Report 779: Teaching, learning, and play in the outdoors: a survey of school and pre-school provision in Scotland. Retrieved from http://www.snh.org.uk/pdfs/publications/commissioned_reports/779.pdf

Masschelein, J. (2010). E-ducating the gaze: the idea of a poor pedagogy. *Ethics and Education*, *5*(1), 43–53. http://doi.org/10.1080/17449641003590621

Maturana, H. R. (1975). The organization of the living: A theory of the living organization. *International Journal of Man-Machine Studies*, *7*(3), 313–332. http://doi.org/10.1016/S0020-7373(75)80015-0

Maturana, H. R., & Varela, F. J. (1987). *The Tree of KNowledge*. Boston and London: Shambala.

McNerney, S. (2011). A Brief Guide to Embodied Cognition : Why You Are Not Your Brain | Guest Blog , S ... Page 1 of 3 A Brief Guide to Embodied Cognition : Why You Are Not Your Brain | Guest Blog , S ... Page 2 of 3. *Scientific American*, 2011–2013. Retrieved from http://blogs.scientificamerican.com/guest-blog/2011/11/04/a-brief-guide-to-embodied-cognition-why-you-are-not-your-brain

Mcphie, J., & Clarke, D. A. G. (2015). A Walk in the Park: Considering Practice for Outdoor Environmental Education Through an Immanent Take on the Material Turn. *The Journal of Environmental Education*, *46*(4), 230–250. http://doi.org/10.1080/00958964.2015.1069250

Mortari, L. (2003). *Aver cura della vita della mente*. Roma: Carocci.

Morton, T. (2007). *Ecology without nature : rethinking environmental aesthetics*. Harvard University Press.

Nazir, J., & Pedretti, E. (2015). Educators' perceptions of bringing students to environmental

consciousness through engaging outdoor experiences. *Environmental Education Research*, 22(2), 288–304. http://doi.org/10.1080/13504622.2014.996208

Nhất Hạnh, T. (2000). *Interbeing : fourteen guidelines for engaged Buddhism*. Full Circle.

Nisbet, E. K., Zelenski, J. M., & Murphy, S. a. (2009). The Nature Relatedness Scale: Linking Individuals' Connection With Nature to Environmental Concern and Behavior. *Environment and Behavior*, 41, 715–740. http://doi.org/10.1177/0013916508318748

Noë, A. (2009). *Out of our heads : why you are not your brain, and other lessons from the biology of consciousness*. New York: Hill and Wang.

Olivos, P., Aragonés, J. I., & Amérigo, M. (2011). The connectedness to nature and its relationship with environmental beliefs and identity, 4(1), 5–19.

Osberg, D., & Biesta, G. (2008). The emergent curriculum: navigating a complex course between unguided learning and planned enculturation. *Journal of Curriculum Studies*, 40(January 2015), 313–328. http://doi.org/10.1080/00220270701610746

Payne, P. G. (2006). Environmental Education and Curriculum Theory Environmental Education and Curriculum Theory. *The Journal of Environmental Education*, 37(2), 25–35. http://doi.org/10.3200/JOEE.37.2.25-35doi.org/10.3200/JOEE.37.2.25-35

Payne, P. G., & Wattchow, B. (2009). Phenomenological Deconstruction, Slow Pedagogy, and the Corporeal Turn in Wild Environmental/Outdoor Education. *Canadian Journal of Environmental Education*, 14. Retrieved from https://files.eric.ed.gov/fulltext/EJ842737.pdf

Reed, E. S. (1996a). *Encountering the World. Toward an Ecological Psychology*. Oxford University Press. http://doi.org/10.1093/acprof:oso/9780195073010.001.0001

Reed, E. S. (1996b). *The necessity of experience*. Yale University Press. Retrieved from https://yalebooks.yale.edu/book/9780300105667/necessity-experience

Reid, D. a., & Mgombelo, J. (2014). Survey of key concepts in enactivist theory and methodology. *Zdm*, 47, 171–183. http://doi.org/10.1007/s11858-014-0634-7

RoSPA. (2017). Accidents to Children. Retrieved January 25, 2018, from https://www.rospa.com/home-safety/advice/child-safety/accidents-to-children/

Ross, H., & Mannion, G. (2012). Curriculum Making as the Enactment of Dwelling in Places. *Studies in Philosophy and Education*, 31, 303–313. http://doi.org/10.1007/s11217-012-9295-6

Ruitenberg, C. W. (2012). Learning by walking: non-formal education as curatorial practice and intervention in public space. *International Journal of Lifelong Education*, 31(3), 261–275. http://doi.org/10.1080/02601370.2012.683604

Schutz, A., & Luckmann, T. (1973). *The structures of the life-world*. Retrieved from https://books.google.co.uk/books/about/The_Structures_of_the_Life_world.html?id=LGXBxI0Xsh8C

Scottish Executive. (2004). *A curriculum for excellence*. Retrieved from http://www.gov.scot/Resource/Doc/26800/0023690.pdf

Scottish Government. (2008). *Curriculum for Excellence. Building the Curriculum 3. A Framework for Learning and Teaching*. Retrieved from https://www.shetland.gov.uk/education/documents/Building_the_curriculum_3_.pdf

Scottish Government, T. (2017). *How to deliver excellence and equity in Scottish Education*. Edinburgh. Retrieved from http://www.gov.scot/Resource/0052/00521039.pdf

Squire, C., Andrews, M., & Tamboukou, M. (2008). What is Narrative Research? In M. Andrews, C. Squire, & M. Tamboukou (Eds.), *Doing Narrative Research* (1st ed., p. 159). London: SAGE Publications.

Tanggaard, L. (2013). The sociomateriality of creativity in everyday life. *Culture & Psychology*, *19*(1), 20–32. http://doi.org/10.1177/1354067X12464987

Thomashow, M. (1996). *Ecological Identity: Becoming a Reflective Environmentalist.* Cambridge, Massachusetts: MIT Press.

Thompson, E. (2007). *Mind in Life*. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.

van Boeckel, J. (2013). *At the Heart of Art and Earth. Thesis submitted for the degree of Doctor of Arts Aalto University, School of Arts, Design and Architectur*.

Varela, F., Thompson, E., & Rosch, E. (1993). *The Embodied Mind. Cognitive Science and Human Experience.* Cambridge, Massachusetts: MIT Press.

Weichold, M. (2017). Enacting the Moral Self – Combining Enactivist Cognitive Science with Mead's Pragmatism. *Pragmatism Today*, *8*(1). Retrieved from http://www.pragmatismtoday.eu/summer2017/Pragmatism_Today_Volume8_Issue1_Summer2017.pdf#page=146

Williams, C. C., & Chawla, L. (2016). Environmental identity formation in nonformal environmental education programs. *Environmental Education Research*, *22*(7), 978–1001. http://doi.org/10.1080/13504622.2015.1055553

Appendix 1 Questionnaire used with Outdoor Learning Students

Relatedness to Nature

This survey is designed to look at individual's connectedness to nature and views and attitudes towards the environment. We are interested in whether your views are related to some of your childhood experiences and how these might change over time through experiences at University.
Participation in this survey is entirely voluntary and all information is confidential.

Are you happy to participate? *(this is a compulsory question for ethics approval)*
☐   *Yes.*   ☐   *No*

ID Number
  _____

Age
☐   *Under 18*   ☐   *18*   ☐   *19*   ☐   *20*   ☐   *21-25*   ☐   *26-30*   ☐   *Over 30*

Are you?
☐   *Male*   ☐   *Female*

Why did you decide to choose this course?
_____
_____
_____

My Childhood

These questions are designed to explore the different kinds of childhood experiences that you had with respect to connections with nature and the outdoors.

For all or most of my childhood I lived (Select one option that best describes where you lived):

☐   *In a large town/city (population > 500,000 e.g. Glasgow/Edinburgh).*

☐   *On the edge of a large town/city. (Population > 500,000 e.g. Glasgow/Edinburgh).*

☐   *In a medium sized town/city (population: 50,000 - 500,000 e.g. Aberdeen/Dundee).*

☐   *On the edge of a medium sized town/city. (Population 50,000 - 500,000 e.g. Aberdeen/Dundee).*

☐   *In a small town or village (population <50,000)*

☐   *On the edge of a small town or village (population <50,000)*

☐   *In the countryside away from centres of population (e.g. in an isolated house, a small group of houses or a farm).*

For Each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 shown below. During my childhood:

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
I spent a lot of time alone in nature (e.g. in the countryside or in a park).	☐	☐	☐	☐	☐

	Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
I spent a lot of time with friends in nature (e.g. in the countryside or in a park).	☐	☐	☐	☐	☐
I would often go on walks with my parents/guardian in the countryside.	☐	☐	☐	☐	☐
I took part in outdoor activities e.g. skiing, canoeing, hillwalking/mountaineering.	☐	☐	☐	☐	☐
I had my own pet which I would care for.	☐	☐	☐	☐	☐
We had a family pet e.g. cat/dog which was treated as part of the family.	☐	☐	☐	☐	☐

Nature Relatedness

This short questionnaire is about your experiences with nature.

Instructions: For each of the following, please rate the extent to which you agree with each statement, using the scale from 1 to 5 as shown below. Please respond as you really feel, rather than how you think "most people" feel. (*In order to get an accurate picture all the questions in this section require an answer* **)**

	Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
1. I enjoy being outdoors, even in unpleasant weather.	☐	☐	☐	☐	☐
2. Some species are just meant to die out or become extinct.	☐	☐	☐	☐	☐
3. Humans have the right to use natural resources any way we want.	☐	☐	☐	☐	☐
4. My ideal vacation spot would be a remote, wilderness area.	☐	☐	☐	☐	☐
5. I always think about how my actions affect the environment.	☐	☐	☐	☐	☐
6. I enjoy digging in the earth and getting dirt on my hands.	☐	☐	☐	☐	☐
7. My connection to nature and the environment is a part of my spirituality.	☐	☐	☐	☐	☐
8. I am very aware of environmental issues.	☐	☐	☐	☐	☐
9. I take notice of wildlife wherever I am.	☐	☐	☐	☐	☐
10. I don't often go out in nature.	☐	☐	☐	☐	☐
11. Nothing I do will change problems in other places on the planet.	☐	☐	☐	☐	☐
12. I am not separate from nature, but a part of nature.	☐	☐	☐	☐	☐
13. The thought of being deep in the woods, away from civilization, is frightening.	☐	☐	☐	☐	☐
14. My feelings about nature do not affect how I live my life.	☐	☐	☐	☐	☐
15. Animals, birds and plants should have fewer rights than humans.	☐	☐	☐	☐	☐
16. Even in the middle of the city, I notice nature around me.	☐	☐	☐	☐	☐
17. My relationship to nature is an important part of who I am.	☐	☐	☐	☐	☐
18. Conservation is unnecessary because nature is strong enough to recover from any human impact.	☐	☐	☐	☐	☐
19. The state of non-human species is an indicator of the future for humans.	☐	☐	☐	☐	☐
20. I think a lot about the suffering of animals.	☐	☐	☐	☐	☐

21. I feel very connected to all living things and the ☐ ☐ ☐ ☐ ☐
earth.

If you would like to add anything please do so in the box below.

_____
_____
_____
_____
_____

You have now finished the questionnaire - please click "Submit".

Many thanks for your participation.
Best wishes

Appendix 2. Scoring for the Nature Relatedness Scale

<u>Scoring Information</u>

Reverse scored items: 2, 3, 10, 11, 13, 14, 15, 18; NR-self items: 5, 7, 8, 12, 14, 16, 17, 21;
NR-perspective items: 2, 3, 11, 15, 18, 19, 20; NR-experience items: 1, 4, 6, 9, 10, 13
Overall NR score is calculated by averaging all 21 items (after reverse scoring appropriate items). Scores on the 3 NR dimensions are also calculated by averaging appropriate items after reverse scoring. (Nisbet et al., 2009)

Table 1 Mean Scores on the different scales at the beginning and end of semester 1

Scale	Pre-Semester 1 n=13	End Semester 1 n=13
Nature relatedness (NR)	3.46	3.81
NR Self	3.24	3.83
NR Perspective	3.76	3.90
NR Experience	3.42	3.67

Table 2. Related Samples Wilcoxon Signed Rank Test

	Statistical significance (P value) Pre-Post Semester 1 (n=13)
NR Scale (Whole)	0.006
NR Scale (Self)	0.002
NR Scale (Perspective)	0.103
NR Scale (Experience)	0.129

Table 3 Global view of codes across the thirteen cases

Nodes	No. of Codings
Affective response	119
Pedagogy and learning	75
Realisations and awakenings	52
Noticing	60
Walking	50
Connections	23
Childhood reflections	15
Weather	13
Relationships and groups	11
Imagination and creativity	11
Environmental Concerns	10
	439