



Nature-based environmental education of children: Environmental knowledge and connectedness to nature, together, are related to ecological behaviour



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ABSTRACT

The promotion of environmental knowledge is viewed as a fundamental component of environmental education and a necessary prerequisite to ecological behaviour; however, it has little effect on actual behaviour. Nature-based environmental education, which combines the acquisition of environmental knowledge with the promotion of an intrinsic driver, namely connectedness to nature, is proposed as a holistic approach to increase ecological behaviour. This paper evaluates the effect of participation in nature-based environmental education in 4th to 6th graders ($N = 255$). As expected, increased participation in nature-based environmental education was related to greater ecological behaviour, mediated by increases in environmental knowledge and connectedness to nature. While both factors were similarly predicted by participation in nature-based environmental education, connectedness to nature explained 69% and environmental knowledge 2% of the variance in ecological behaviour. However, the design of our data do not evidence the causality of these relations, which are solely based on theoretical assumptions supported by literature. Nevertheless, the importance of fostering both environmental knowledge and connectedness to nature as complementary drivers of ecological behaviour, as offered by nature-based environmental education, should be researched further as a highly promising approach to fostering ecologically-motivated individuals.

1. Introduction

It is widely agreed that current human behaviour has detrimental impacts on the planet's environment (e.g., IPCC, 2014); thus, avenues for understanding and ultimately increasing the ecological behaviour of individuals are required. Environmental education can serve as a critical tool in countering environmental problems as it strives toward the goal of environmental protection and conservation (e.g., Potter, 2009; Palmer, 1998). Environmental education aims to impact not only an individual's internal representations and understandings of the world, but ultimately to intrinsically motivate people to perform appropriate real-life behaviours (McClelland, 1973). Indeed, education is regarded as an indispensable requirement if we want to promote sustainable development successfully (Michelsen and Fischer, 2017).

Intrinsic motivation to behave ecologically, as Otto et al. (2014) explain, is a crucial requirement to reduce humanity's detrimental effect on the planet, as extrinsic motivations (e.g., incentives, punishments) are often met with opposition and have only temporary effects (De Young, 2000). Thus, to authentically mitigate anthropogenic

environmental problems, fostering intrinsic motivation to behave ecologically is essential (Otto et al., 2014). Numerous scholars have argued for environmental education to promote intrinsic motivation in addition to providing appropriate information (e.g., Kollmuss and Agyeman, 2002; Kaiser et al., 2008; Monroe, 2003). As in childhood the motivation to be ecologically friendly is formed and probably has a lifelong effect (Evans et al., 2007), the environmental education of children is thus especially important.

This paper investigates the correlates of participation in nature-based environmental education on children's ecological behaviour. In doing so, the competence model of environmental education (Kaiser et al., 2008; Roczen et al., 2014) is examined. This model proposes that the development of an intrinsic motivation by way of feeling connected to nature, in combination with the acquisition of environmental knowledge, are required to authentically produce ecological behaviour. Conducting environmental education directly in nature or close to nature, as offered by nature-based environmental education institutions, such as forest schools or conservation centres, addresses environmental knowledge while also fostering nature connectedness. We

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will be the first to show that the frequency of children's visits to nature-based environmental education institutions is related to ecological behaviour through the acquisition of environmental knowledge and connectedness to nature.

1.1. Environmental knowledge

Environmental knowledge is important in producing ecological behaviours because an individual must know what type of actions to take. Thus, environmental knowledge is an intellectual prerequisite to performing ecological behaviour (Frick et al., 2004; Gardner and Stern, 2002; Otto and Kaiser, 2014). Although participation in environmental education programs commonly has positive effects on environmental knowledge (Rickinson, 2001; Liefländer et al., 2015), the relation between environmental knowledge and ecological behaviour has been disputed (e.g., Geiger et al., 2014; Frick et al., 2004), and may be influenced by several factors, such as motivational components in the form of personal values and attitudes (e.g., Gatersleben et al., 2002). Previous research investigating the relationship between environmental knowledge and ecological behaviour shows that environmental knowledge, more often than not, fails to directly influence ecological behaviour (e.g., Kals et al., 1999; Hines et al., 1986/87; Steg and Vlek, 2009), or does so only weakly (e.g., Frick et al., 2004). In fact, fostering singular knowledge, even directly related to a specific ecological behaviour, seems to have – if at all – one of the lowest effects (e.g., Abrahamse et al., 2005; Otto et al., 2016). What is missing in knowledge approaches not just with respect to ecological behaviour is a motivational component.

1.2. The motivational component in education

Motivation as an important educational component has been recently acknowledged in several educational-related fields. Especially in the fields of education for sustainable development (which originated from environmental education), and global learning, knowledge is but one part of their conception of education. Global learning clearly defines the promotion of motivation as one core component beside the acquisition of knowledge, and ethical guidelines (Michelsen and Fischer, 2017). Within this line of argumentation falls the call for deeper learning and education for sustainable development (Warburton, 2003), because holistic insight and the ability to manage contrasting types of information is central to sustainable development and also to ecological behaviour. Deeper learning fosters the comprehension of underlying meaning, cross-referencing, and independent thinking, which are all highly relevant to ecological and sustainability issues. But most importantly, in the case of deeper learning students are internally motivated and have an intention to understand – in contrast to simply pass a test. Therefore, an educational setting has to be provided where students develop a strong personal motivation in sustainability issues (Warburton, 2003). Also in Science Technology Engineering and Mathematics (STEM) fields, both knowledge in combination with sufficient motivation are seen as essential prerequisites for the mastery of related behaviour (e.g., OECD, 2015). Based on the insight regarding the necessity of a motivational component, a more holistic competence model is promoted (see e.g., NATIONAL RESEARCH COUNCIL, 2012; OECD, 2015). With specific respect to environmental education, Kaiser et al. (2008) similarly propose a competence model that incorporates both environmental knowledge and a specific motivational component, that is, connectedness to nature.

1.3. Connectedness to nature

Connectedness to nature refers to the perceived closeness in the relationship between an individual and nature (Brügger et al., 2011; Mayer and Frantz, 2004; Clayton, 2003; Schultz, 2001; Nisbet et al.,

2009), and has been found in a multitude of studies to have a positive relationship to ecological intention and behaviour (e.g., Pensini et al., 2016; Barbaro and Pickett, 2016). Indeed, connectedness to nature seems to be the strongest predictor of (or at least does have the strongest relation to) ecological behaviour. That connectedness to nature and ecological behaviour share up to 60% of common variance has been shown across different studies and with different measures (e.g., Roczen et al., 2014; Brügger et al., 2011; Pensini et al., 2016). The strength of this relation is important for approaches to foster ecological behaviour, because it outperforms all other variables' (e.g., moral and normative concern) relations to ecological behaviour and even models (e.g., the norm activation model) that include a number of such variables do not explain more variance in ecological behaviour than connectedness to nature does (for a comprehensive review see Steg and Vlek, 2009). Even more so, the relation between connectedness to nature and ecological behaviour seems to be robust throughout all life stages as it holds for children (e.g., Cheng and Monroe, 2012), adolescents (e.g., Roczen et al., 2014), and adults (e.g., Mayer and Frantz, 2004; Tam et al., 2013).

Connectedness to nature is reasoned to be a necessary prerequisite for engagement in ecological behaviours (e.g., Kossack and Bogner, 2012; Roczen et al., 2014; Frantz and Mayer, 2014). It provides an intrinsic motivation for adopting a more ecological lifestyle as, when one is more connected to nature, knowingly causing harm to the natural environment impacts the self more directly (e.g., Schultz, 2002a; Metzner, 1999). Considering that connectedness to nature is an indication of the closeness between the individual and nature, like other relationships, this can be fostered by contact and experiences (Pensini et al., 2016). For instance, exposure to nature as opposed to an urban environment (Mayer et al., 2009), repeated visits to natural areas (Schultz and Tabanico, 2007), and also having nature close to home (Cheng and Monroe, 2012) are all positively related to connectedness to nature.

1.4. Environmental knowledge and connectedness to nature – related but independent constructs

The combination of environmental knowledge and connectedness to nature serve as the drivers of individual's ecological behaviour (Kaiser et al., 2008). Considering the interrelatedness of these constructs, acquiring knowledge of the functioning of the natural environment may, for example, confront individuals with the interconnectedness of all life, impacting their connectedness to nature. Increases in environmental knowledge may also follow from connectedness to nature. With connectedness to nature an individual may become more interested in learning about the natural environment and how to protect it. Empirical findings suggest that environmental knowledge and connectedness to nature are only weakly interrelated (Kaiser et al., 2008; Roczen et al., 2014; Bamberg and Moser, 2007). This is most reasonably due to the extremely low levels of environmental knowledge demonstrated in the sample. Very low levels of environmental knowledge are, in fact, not uncommon, and were similarly found in other studies (e.g., Frick et al., 2004). Thus, connectedness to nature demonstrated to be a much stronger predictor of ecological behaviour than environmental knowledge, and explained approximately one third of the variance in ecological behaviours (Roczen et al., 2014).

Even though environmental knowledge and connectedness to nature go hand-in-hand conceptually in promoting ecological behaviour, they relate only weakly as their common variance is only about 1% (Roczen et al., 2014). Furthermore, it is not clear which of the two, if either, comes first. While their weak relation speaks of some mutual effect upon each other on the basis of an individual's past, we propose that in a nature-based environmental educational setting these two components are addressed simultaneously and their effect on each other cannot be analysed in such settings.

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