





# Environmental values and environmental concern

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## ABSTRACT

Attitudes, values and concerns are frequently measured to monitor individual preferences of adolescents. As there is still some discussion about how to monitor those variables with respect to empirical instruments, directions of items or length of instruments, we applied two established scales (2 Major Environmental Value Model [2-MEV] and Environmental Motives Scale [EMS]) to a Slovenian sample of 804 middle and high school students. Subsequently, we confirmed the validity and reliability of both scales as well as their applicability to Slovene subjects, aged 12–18 years. The main objective of our study was to explore the relationship between three factors of environmental concern (EMS) and the two higher-order factors of utilisation of nature and preservation of nature (2-MEV). The results show that altruistic (ALT), biospheric (BIO) and egoistic (EGO) environmental concerns correlate strongly positively with preservation of nature, but negatively and less strongly but still significantly with utilisation of nature. We conclude that raising awareness of EGO environmental concern may be as important as ALT and/or BIO concern for understanding the environmental values and attitudes of an individual. Consequences and recommendations for designing and completing educational programmes are discussed.

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## Introduction

Human behaviour substantially affects our natural environment, making environmental problems among the most pressing social problems of our time. Addressing these issues will require substantial shifts in the way in which we treat nature and the environment (IPCC 2014). Major environmental problems sooner or later generate unpleasant living conditions for everyone. Surveys indicate that a high percentage of people in Europe and other parts of the world express severe concern about environmental issues (e.g. Dunlap 2008; Eurostat 2008, 2011). Unfortunately, behaviour gaps are common as people frequently fail to engage in appropriate behaviour. Numerous theoretical frameworks have been developed to explain this gap (Kaiser 2006; Kollmuss and Agyeman 2002). Individual concerns are complex facets based upon a variety of theoretical foundations, often based in practice upon existing psychometric definitions encapsulating degrees of favour or disfavour (Eagly and Chaiken 1993). The list of grass root thinkers is long, and goes back to the last century laying (philosophical) foundations (e.g. Dewey 1925, 1929; Muir 1916; Leopold 1949; Carson 1962, just to mention a few pioneers).

Any environmental education initiatives strive towards empowering for environmentally responsible actions (Leeming, Dwyer, and Bracken 1995), but these actions are challenging to

monitor or to predict. Nevertheless, attitudes are regarded as important predictors and vital determinants of behaviour (e.g. Bogner and Wilhelm 1996; de Groot and Steg 2007; Kaiser 2006). In the 1980s, ecocentric views postulated the New Environmental Paradigm (Dunlap and Van Liere 1978), the New Ecological Paradigm (Dunlap et al. 2000) or the Ecological World View (Blaikie 1992). Simultaneously, the Dominant Social Paradigm (Pirages and Ehrlich 1974; Dunlap and Van Liere 1978) was established to subsume anthropocentric (exploitative and utilitarian) views that regard our planet as an unlimited resource for growth-for-ever fantasies and extensive consumption illusions. In line with this issue, empirical studies concentrated on the motives underlying environmental preferences: according to Schultz and Zelezny (2003) such studies may allow us to better understand types of environmental concerns that drive individuals to act in an environmentally friendly manner. In general, ecocentric and anthropocentric preferences are postulated in a broad model formulated to explain individual differences in pro-environmental attitudes and behaviour (e.g. Bogner, Brengelmann, and Wiseman 2000). On the other hand, Stern, Dietz, and Kalof (1993) proposed a classification called value-basis theory or, later, modified value-belief-norm (VBN; Stern and Dietz 1994) by extending an existing norm-activation theory of altruistic (ALT) behaviour (Schwartz 1973; Schwartz and Howard 1981). The norm-activation theory of altruism theory holds that actions occur in response to the moral norms of an individual. These norms are activated in individuals who are aware of consequences to other people, other species, or the biosphere, and therefore act in order to avert those consequences (Schwartz 1973). The VBN theory considers values or valued objects as providing the source of environmental concern: people's attitudes about environmental issues and pro-environmental behaviour are assumed to be based on self (egoistic [EGO]), other people (social-ALT), or all living things (biospheric [BIO]) value orientations (Stern and Dietz 1994). EGO values are said to focus on self and self-oriented goals, such as social power, wealth and personal success while social-ALT ones focus on other people, such as family members, friends and humanity in general. BIO values are assumed to focus on the well-being of all living things, such as plants, animals and trees. For example, concern for air pollution can be based upon fundamentally different reasons: Polluted air is dangerous to my health (EGO), polluted air is dangerous to the health of children (ALT), or polluted air is damaging to forests (BIO; Schultz 2000). Thus, concern for environmental issues may originate in the awareness and belief of harmful consequences leading to all three sets of values (valued objects) and concern for environmental issues (Schultz et al. 2004): A person's belief about how he or she is a part of the natural environment provides the foundation for the types of environmental concerns a person develops. Thus, the argumentation is in line with a hierarchical structure where the EGO level subsumes both social-ALT and BIO preferences: the Inclusion Model for Environmental Concern (De Dominicis, Schultz, and Bonaiuto 2017) provides the template. Consequently, individuals with EGO value orientations may behave more pro-environmentally when their behaviour results in a personal benefit (but not if there is an exclusively environmental benefit), while individuals with ALT value orientations will act pro-environmentally when there are environmental benefits, and also when there are personal benefits. Subsequently, many scales were developed including EGO, social-ALT and BIO value orientations. Later, the Environmental Motives Scale (EMS) was given priority due to high reliability scores and a satisfactory factor structure (e.g. De Dominicis, Schultz, and Bonaiuto 2017), as well as cross-cultural validity (e.g. de Groot and Steg 2007; Schultz et al. 2005; Torkar 2016). Cross-validation studies with other item batteries (Schultz et al. 2005), such as connectedness with nature (Schultz 2001) or pro-environmental behaviour (de Groot and Steg 2007), provided further insight.

A meta-analysis by Leeming et al. (1993) found no instrument measuring environmental attitudes to be appropriate for adolescents. In consequence, during the late-1990s, with a desperate need for an appropriate measure, the 2 Major Environmental Value model (2-MEV) scale was developed by integrating and adjusting many existing approaches (Bogner 1999, 2000; Bogner and Wilhelm 1996; Bogner, Brengelmann, and Wiseman 2000; Bogner and Wiseman 1999, 2002,

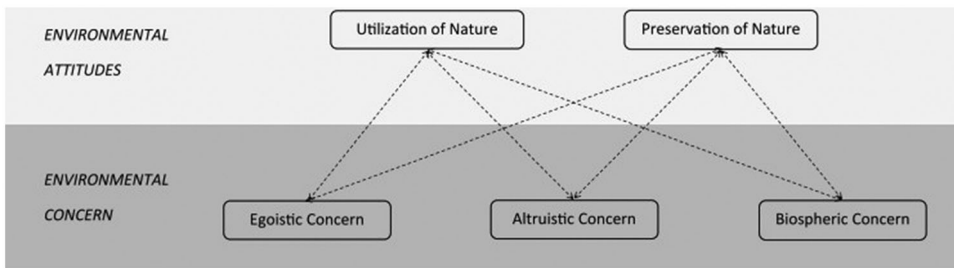


Figure 1. Measurements of correlations between the two higher order factors of the 2-MEV scale and three sets of values in EMS.

2004, 2006). These efforts finally led Wiseman and Bogner (2003) to incorporate the yielded first order factors to the two higher-order factors measure: preservation (PRE) and utilisation (UTL). A subsequent series of bi-national studies (e.g. Bogner and Wiseman 1997a, 1998, 2002) led to a 20-item scale where, following a definition of Rokeach (1968) first-order factors were labelled 'attitudes' and second-order factors 'values'. Wiseman and Bogner (2003) described PRE as bio-centric dimension including conservation, stewardship and protection, while UTL encapsulated the anthropocentric dimension of utilisation/exploitation of natural resources. Applying the instrument in many European countries and languages has demonstrated the scale's validity within different cultural contexts (Munoz et al. 2009; Castéra et al. 2018). Additionally, pre-test cohorts in the succeeding eight years were monitored, revealing clear constancy in the factor loading pattern and scores (Bogner et al. 2015).

Nevertheless, even half a decade after development, the 2-MEV scale remained just a scale amongst many until a series of independent studies repeatedly demonstrated the validity and reliability of the 2-MEV scale. (i) Milfont and Duckitt (2004), working in a psychometric context, examined a sample of 455 New Zealand freshmen and confirmed the two-factor second-order structure; (ii) some years later Johnson and Manoli (2008), from a didactic background did so again with a US school sample; (iii) a Flemish study within a state-wide eco-school initiative also obtained the two-factor structure (Boeve-de Pauw and van Petegem 2011); and (iv) finally, a West African sample again confirmed the quality of the instrument within the context of a developing country (Borchers et al. 2013). Thus, repeated independent confirmation of the 2-MEV scale from a variety of theoretical backgrounds had already taken place more than a decade ago. This provided the basis for confirmation of the instrument quality before applying them elsewhere (McLeod 2018). Therefore, the 2-MEV currently is in the favourable situation to allow inter-study comparisons on a solid foundation of the current psychology of sustainable development (Boeve-de Pauw 2011). Even more, since the 2-MEV implies no conflict between assigning importance to preserving the environment and the need to make use of natural resources, it offers an empirical instrument for assessing a wide variety of educational programmes.

Our present study had three objectives: (1) to re-examine the psychometric structure of both the 2-MEV and the EMS (Figure 1), (2) to correlate the two, and (3) to test for any gender differences. The expectation is to provide measures to monitor the attitudes of future Slovenian cohorts.

## Methods and procedures

A sample of 804 Slovene students (female: 58.5%), aged 12–18 years, completed an online questionnaire. A convenience sample was used to recruit students willing to participate. Questionnaires were digitally completed during normal school schedules in classrooms. Measures were administered in Slovenian. Besides basic socio-demographic and socio-psychological variables, Schultz's (2000, 2001) measure for environmental concern and the 2-MEV scale (Wiseman

and Bogner 2003; Kibbe, Bogner, and Kaiser 2014) were applied. Slovenia has 103 inhabitants/km<sup>2</sup> (for comparison, Germany scores has 232, France 103, Austria 105, and Hungary 106). Both the latter are immediate neighbours of Slovenia and have similar population pressures as Slovenia.

The 2-MEV Scale (Wiseman and Bogner 2003, as modified by Kibbe, Bogner, and Kaiser 2014) was used to measure two higher-order values: preservation of nature and utilisation of nature. Nine of twenty items were negatively formulated. The questionnaire utilises a 5-point Likert scale with responses ranging from strongly agree (5-points) to strongly disagree (1-point) with a neutral mid-point response not sure (3-points). The 2-MEV scale was first time applied in Slovenian, therefore a forward and back translation process, which included two experts in science education, was used. Only minor changes in wording were necessary. Finally, the translated version was tested on 18 secondary school students (aged 14–15) in order to assure that items were understood.

Environmental Motives Scale: 12 items were used to measure concern for environmental problems caused by humans (Schultz 2000, 2001). Concern about environmental issues is divided into three categories: EGO, ALT, and BIO. Participants rated items on degree of concern from 1 (not important) to 7 (extremely important). The items making up the EMS have varied somewhat between studies (Schultz 2000, 2001; Schultz et al. 2004; Bruni, Chance, and Schultz 2012). In the present study, items from Schultz et al. (2004, 2005) were used, with one modification replacing the item 'marine life' with 'all living things' in order to avoid possible regional differences by respondents of coastal and continental areas of Slovenia. EGO items were 'me', 'my future', 'my lifestyle', and 'my health'. ALT items were 'all people', 'all children', 'people in the community', and 'future generations'. BIO items were concerned with 'animals', 'plants', 'birds' and 'all living beings'. Items order was random. Since EMS had previously been used in Slovenian (Torkar 2016), no additional validity check of the instrument was performed.

The 20 items of the 2-MEV scale and the 12 items were subjected to principal component analysis (PCA) with oblimin rotation using the Statistical Package for the Social Sciences (SPSS). Prior to performing PCA the suitability of data for factor analysis was assessed with the Kaiser–Meyer–Olkin value (Kaiser 1970, 1974) and Bartlett's Test of Sphericity (Bartlett 1954). In addition, confirmatory factor analysis (CFA) was used to assess the fit of the three-factor model of EMS (Schultz 2000, 2001). Four indices were used to assess the fit of the three-factor model, including the CFI, TLI, RMSEA and its 90% confidence interval, and SRMR. These are standard indices for CFA that indicate the degree of fit of the model. CFI and TLI values  $\geq 0.90$  are considered acceptable and values  $\geq 0.95$  are considered excellent (Byrne, 2012; Marsh, Hau, and Wen 2004). For the indices of misfit, that is, the RMSEA and SRMR, values  $\leq 0.08$  are considered acceptable and values  $\leq 0.05$  are considered excellent. Basic descriptive statistics of the numerical variables ( $M$  and  $SD$ ) were computed. Pearson's correlation coefficient quantified the relationship between environmental attitudes (preservation and utilisation) and measures of environmental concerns.

## Results

The results of the PCA with oblimin rotation of the 2-MEV scale are described in Table 1 and Figure 2. The Kaiser–Meyer–Olkin value was 0.88, exceeding the recommended value of 0.60 (Kaiser 1970, 1974), and Bartlett's Test of Sphericity (Bartlett 1954), reaching statistical significance ( $\chi^2 = 3788.03$ ,  $df = 190$ ,  $p < 0.001$ ). Correlation between the two factors was low ( $r = 0.330$ ), reflecting a little over 10% common variance. We tested the original factor structure (Wiseman and Bogner 2003; Kibbe, Bogner, and Kaiser 2014). Two items (11 and 13) were dropped from the analysis due factor loadings below 0.4. For further analysis, mean scores for the 2-MEV scale were computed: PRE ( $M = 4.285$ ,  $SD = 0.675$ ) and UTL ( $M = 2.320$ ,  $SD = 0.622$ ).

Table 1. Factor structure of the 2-MEV items.

Item	PRE	UTL
1. It upsets me to see the countryside taken over by building sites.	-0.621	
5. I always switch the light off when I do not need it.	-0.616	
7. Dirty industrial smoke from chimneys makes me angry.	-0.604	
15. Humans do not have the right to change nature as they see fit.	-0.592	
4. Humankind will die out if we do not live in tune with nature.	-0.590	
2. I save water by taking a shower instead of a bath (in order to spare water).	-0.582	
9. It is interesting to know what kinds of creatures live in ponds or rivers.	-0.580	
20. Not only plants and animals of economic importance need to be protected.	-0.502	
18. Human beings are not more important than other creatures.	-0.398	
11. Weeds are as much important as beautiful flowers.		
13. Worrying about the environment does not hold up development projects.		
12. Our planet has unlimited resources.		0.677
14. Nature is always able to restore itself.		0.661
17. We must build more roads so people can travel to the countryside.		0.618
16. We need to clear forests in order to grow crops.		0.613
6. Society will continue to solve even the biggest environmental problems.		0.610
19. People worry too much about pollution.		0.607
8. The quiet nature outdoors makes me anxious.		0.604
3. We do not need to set aside areas to protect endangered species.		0.549
10. Sitting at the edge of a pond watching dragonflies in flight is boring.		0.463

PRE, preservation; UTL, utilisation.

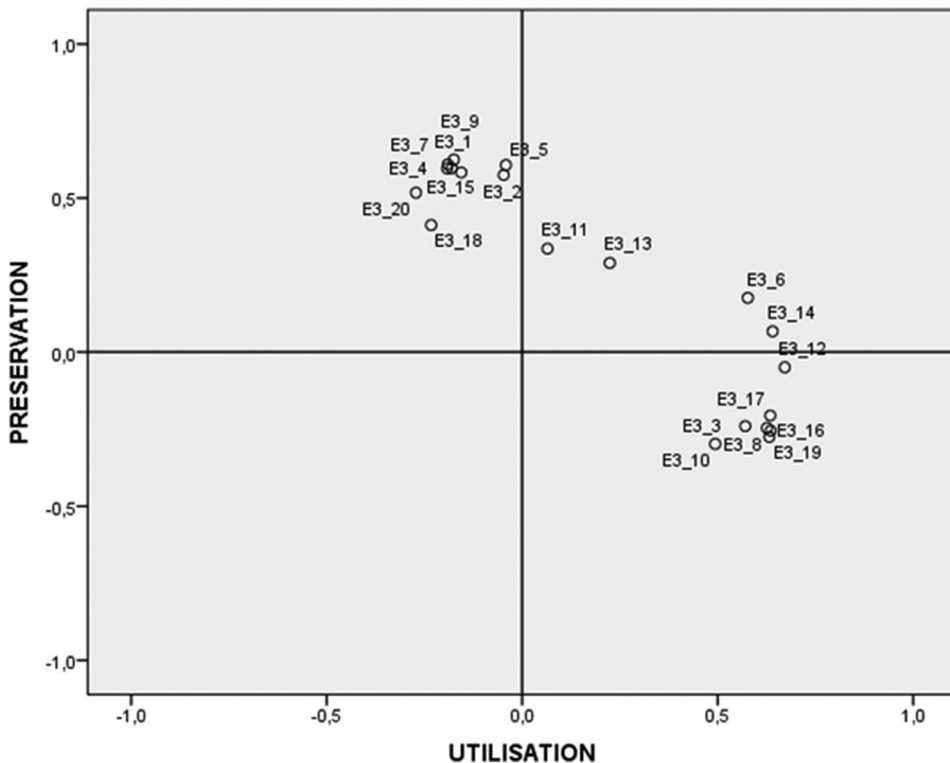


Figure 2. Graphical representation of the factor solution (item meaning see Table 1).

The loadings of item-11 and item-13 were low and tended towards UTL (Figure 1 and Table 1). Cronbach’s  $\alpha$  for the two factors showed acceptable internal consistency: UTL ( $\alpha=0.87$ ) and PRE ( $\alpha=0.78$ ).

For the 12 items of the EMS the Kaiser-Meyer-Olkin value was 0.909, exceeding the recommended value of 0.6 (Kaiser 1970, 1974) and the Barlett’s Test of Sphericity (Bartlett 1954)

**Table 2.** Factor loadings from the Environmental Motives Scale (EMS).

Item	BIO	EGO	ALT
11. Animals.	0.914		
12. Plants.	0.879		
8. Birds.	0.866		
6. All living beings.	0.638		
3. My health.		0.865	
5. My lifestyle.		0.852	
1. Me.		0.818	
9. My future.		0.762	
7. People in my community.			
4. All children.			-0.921
2. All people.			-0.900
10. Future generations.			-0.612

ALT, altruistic; BIO, biospheric; EGO, egoistic.

**Table 3.** Correlations between measures of environmental concern, preservation and utilisation.

		BIO	EGO	ALT
PRE	Pearson Correlation	0.727**	0.590**	0.792**
	Sig. (2-tailed)	<0.001	<0.001	<0.001
	N	804	804	804
UTL	Pearson Correlation	-0.327**	-0.087*	-0.231**
	Sig. (2-tailed)	<0.001	0.013	<0.001
	N	804	804	804

ALT, altruistic; BIO, biospheric; EGO, egoistic; PRE, preservation; UTL, utilisation.

\*Correlation is significant at the 0.05 level (2-tailed).

\*\*Correlation is significant at the 0.01 level (2-tailed).

achieved statistical significance (chi-square = 6417.965,  $df=66$ ,  $p < 0.001$ ), thus supporting the factorability of the correlation matrix. The EMS factors were consistent with those found in previous research representing BIO, EGO, and ALT concerns (Table 2). These three factors explained 73.8% of the total variance. The scree-plot proposed by Cattell (1966) suggested three components for further investigation. The same occurred with the utilisation domain. One item (7) was dropped from the analysis due to crossloading. Mean scores for each factor were calculated (BIO, EGO, or ALT concerns): ALT concern yielded the highest mean ( $M=5.546$ ,  $SD = 1.263$ ), followed by BIO ( $M=5.429$ ,  $SD = 1.292$ ) and EGO mean concerns ( $M=5.283$ ,  $SD = 1.108$ ). There were positive correlations between the concern scores that for EGO and ALT was moderate, EGO and BIO also moderate, and ALT and BIO strongly positive (Table 3). To further support a three-factor model, EMS was tested using CFA to see if it is consistent with the model reported by Schultz (2000, 2001). The results from this analysis showed that the three-factor model provided acceptable fit (chi-square = 405.09,  $df=51$ ,  $p < 0.001$ ). Three out of four fit indices were in the excellent range (CFI = 0.994; TLI = 0.992; RMSEA = 0.093 (90% CI: 0.085–0.102); and SRMR = 0.055). Cronbach's  $\alpha$  for the three scales ranged from acceptable to excellent internal consistency: BIO ( $\alpha = 0.907$ ), EGO ( $\alpha = 0.854$ ), and ALT concern ( $\alpha = 0.863$ ).

The second set of analyses examined the relationship between measures of environmental concern and preservation and utilisation factors. As shown in Table 3, ALT concern correlated strongly and positively with the preservation of nature and weakly and negatively with utilisation of nature. BIO concern showed a strong positive correlation with preservation and a weak negative correlation with the utilisation of nature. EGO concern showed moderate positive correlation with preservation and very weak negative correlation with the utilisation of nature.

Gender differences in utilisation of nature, preservation of nature, EGO environmental concern, ALT environmental concern, and BIO environmental concern were examined. The difference between female ( $M = 2.220$ ,  $SD = 0.608$ ) and male students ( $M = 2.463$ ,  $SD = 0.615$ ) in the utilisation of nature was small but significant ( $t = -5.555$ ,  $df = 802$ ,  $p < 0.001$ , Cohen's  $d = 0.344$ ). Males

agreed very slightly more strongly with attitudes of utilisation of nature. Female students ( $M = 3.777$ ,  $SD = 0.564$ ), in contrast, had more positive attitudes towards preservation of nature than male students ( $M = 3.562$ ,  $SD = 0.592$ ,  $t = -5.182$ ,  $df = 802$ ,  $p < 0.001$ , Cohen's  $d = 0.365$ ) [what was the male value?]. There were no statistically significant differences in EGO environmental concern between male and female students ( $t = 1.879$ ,  $df = 658.721$ ,  $p = 0.061$ ). The difference between female ( $M = 5.720$ ,  $SD = 1.166$ ) and male students ( $M = 5.298$ ,  $SD = 1.354$ ) in the ALT environmental concern was significant ( $t = 4.602$ ,  $df = 640.900$ ,  $p < 0.001$ , Cohen's  $d = 0.342$ ), in favour of females. Females ( $M = 5.622$ ,  $SD = 1.246$ ) were also significantly more concerned for the biosphere than male students ( $M = 5.152$ ,  $SD = 1.309$ ,  $t = 5.165$ ,  $df = 802$ ,  $p < 0.001$ , Cohen's  $d = 0.367$ ).

## Discussion

There is strong evidence that the Slovene version of the 2-MEV and the EMS are well suited to students aged 12–18 years. Construct validity and reliability measures of the 2-MEV and the EMS are again confirmed. Although the 2-MEV scale has shown its suitability in about 30 language versions (Bogner 2018), its application in Slovenia needed confirmation in order to assure its suitability for evaluation purposes of national educational programmes. This procedure is in line with other transfers into national languages, for instance, in the early stages of the 2-MEV applied by the creators of the scale (e.g. Bogner and Wiseman 1997a, 1998, 2002) or other groups (Johnson and Manoli 2008; Munoz et al. 2009; Schneller, Johnson, and Bogner 2015). The same was true for urban and rural student populations (Bogner and Wiseman 1997b). In consequence, it is advisable to test the scale's suitability before application.

A close relationship exists between different environmental concerns and the two higher-order factors: utilisation of nature and preservation of nature. Tensions between ALT and self-interested (EGO) foundations of environmental attitudes and behaviours has long been in discussion (De Dominicis, Schultz, and Bonaiuto 2017). Schultz et al. (2005) as well as Gifford and Nilsson (2014) showed ALT orientation to be associated with amplified levels of environmental concern and with pro-environmental behaviour, whereas an EGO self-interested orientation tends to be negatively associated with environmental concern and behaviour. On the other hand, Kibbe, Bogner, and Kaiser (2014) reported that the more people appreciate nature for personal benefits, the more they tend to preserve the environment. Our results strongly support De Dominicis, Schultz, and Bonaiuto (2017) who described both altruists and self-interested individuals as motivated to engage in pro-environmental behaviour. We, too, anticipate a positive correlation between ALT and BIO environmental concerns and with preservation, that is, the students can have different reasons for concerns but still express attitudes of preservation of nature: this contradicts Schultz et al. (2005) as well as Gifford and Nilsson (2014) while confirming De Dominicis, Schultz, and Bonaiuto (2017). Furthermore, all three reasons for environmental concern seem weakly and negatively correlated with utilisation of nature. Most intriguing is the positive relationship between EGO environmental concern and preservation of nature. Stern, Dietz, and Kalof (1993) demonstrated a positive relationship between egocentric environmental concern and willingness to take part in political action, to pay higher income taxes and to pay more for gasoline. The message of this present study is important for designing environmental education programmes. Building on the results, we argue that raising students' awareness of harmful environmental consequences for them, other people and/or the biosphere can be an important foundation for the development of environmental values and attitudes.

Some previous studies have demonstrated that values, attitudes and concerns towards environmental issues differ between groups delineated by gender. A significant gender difference has been reported, particularly in studies examining concern about environmental problems that pose health and safety risks to participants and their families (e.g. Marshall 2004). Additionally,

socialisation environments such as rural or urban residencies have been shown to be influential (Bogner and Wiseman 1997a, b; Yu 2014). Regarding gender effects Bogner et al. (2015) reported negligible differences, in utilisation of nature as well as in preservation of nature, for elementary and middle school students sampled from three states in the USA. For all measures of environmental concern, our study showed female students as scoring significantly higher in ALT environmental concern and BIO environmental concern, though effect sizes are small, in line with Schultz (2000) who reported adult women as scoring higher than men on all three measures of environmental concern. Stern, Dietz, and Kalof (1993) found that women tend to see environmental quality as more to have consequences for personal well-being, social welfare, and the health of the biosphere. A simple explanation of these findings is that such differences are the consequences of child socialisation, which become a source of gender differences in environmental concern. Sociological theories of gender emphasise gender differences in the socialisation process and/or social roles and status in the society (e.g. Gilligan 1982; Davidson and Freudenburg 1996; Xiao and McCright 2015).

## Conclusion

In common with Europe as a whole, the Slovene educational policy (e.g. White Paper on Education in the Republic of Slovenia 2011; School Curriculums for Science Subjects etc.) recommends and urges action to improve adolescent concern for the environment and environmental attitudes. In light of the fast development of environmental education practice, educators can fulfill strong demands for evaluating outcomes in environmental curricula by monitoring the (expected) understanding of students' environmental attitude. As an appropriate tool, the 2-MEV Scale has been used several times to evaluate the effectiveness of educational programmes (e.g. Liefläender and Bogner 2014; Manoli et al. 2014; Schöenfelder and Bogner 2017). It has been translated into different languages but also separately confirmed, by allowing comparison of programme assessments with regard to both, the embedded national tradition: Europe alone has more than 50 school systems with mostly different languages as well as different programme traditions concerning methods of incorporating this complex issue into formal and informal frameworks. The present study was the first attempt to apply the 2-MEV scale to adolescents in Slovenia and to provide first-hand information about how the modified scale works in the Slovene context. As the scale showed a stable structure even when some items were modified and adjusted to local requirements (Bogner 2018; Schneller, Johnson, and Bogner 2015), subsequent studies could also make some modifications based on local conditions. In future research it would also be interesting to examine the 2-MEV scale and the Environmental Motives Scale using the Rasch model.

The present study represents the first attempt to relate the measures of the EMS and the 2-MEV and to demonstrate how EGO environmental concern may be identified in its role for the individual development of environmental values and attitudes. Therefore, EGO environmental concerns need addressing in formal and informal environmental education. Educational initiatives should show students how caring for the environment is good for everyone, in benefitting from conserving ecosystems. Educating students about ecosystem services could be an effective means of communicating the significance of various ecosystems and human dependence on ecological life-support systems. In this way students can learn to value ecosystems, as well as to better evaluate their interactions with them (Torkar 2016; Torkar and Krašovec 2019).

These instruments will enable us to determine expected changes in environmental values, attitudes and concerns among Slovene students. Due to time constraints the number of items is also an important issue. In this respect, the instruments with their comparatively low number of items are practical tools for evaluating educational programmes. A follow-up study of our current



sample before leaving secondary school is planned, with the intent to monitor long-term impacts on these variables.

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## Disclosure statement

No potential conflict of interest was reported by the authors.

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**Franz X. Bogner** (with a PhD in neurobiology, a Habilitation in Biology Education as well as a post-doctoral fellowship at the Cornell University, USA) is the Department head and full professor of the Institute of Biology Education as well as the director of the Z-MNU (Centre of Math & Science Education) at the University of Bayreuth. He and his research group are mainly involved in pre-service teacher education and in-service teacher enhancement. Prof. Bogner's research projects consistently included cognitive (and emotional and attitudinal) assessment. His citation impact factor is  $h = 36$ , his best paper (Bogner 1998) is  $>500\times$  cited.

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