Values, beliefs and norms that foster Chilean and German pupils' commitment to protect biodiversity

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Fostering young people's commitment to protect biodiversity is an important goal of Education for Sustainable Development (ESD) in both, industrial countries and designated biodiversity hotspots. However, little empirical evidence exists to describe factors that influence such commitments. Based on the Value-Belief-Norm (VBN) theory, 15 to 19-year-old Chilean (n= 216) and German (n= 217) pupils' commitment to protect biodiversity was investigated. Comparisons revealed that Chilean adolescents showed higher personal norms and commitments to protect biodiversity. Regression analysis showed that within the German sample, the 'Schwartz'-value universalism was an important predictor for three different kinds of behavioural commitment. In both samples, 'ascription of responsibility', 'perceived ability to reduce threat' and, above all, 'personal norms' were positive predictors. The paper concludes with a discussion of the results in the light of existing evidence and suggests implications for biodiversity education.

Keywords: Value-Belief-Norm Theory, Chile, Germany, biodiversity education, behavioural commitment

Introduction

It is unquestioned today that Education for Sustainable Development (ESD) should be an integrative part of school curricula and extracurricular educational activities around the world (e.g. UNCED, 1992a). In the school context, science education (and especially the subject biology) play a crucial role in contributing to ESD. However, little basic empirical evidence exists so far to address the question how educational interventions should be designed in order to foster young peoples' commitment to pro-environmental activities.

Biodiversity loss has always been among the most urgent challenges for sustainable development (UNCED, 1992b; WCED, 1987; Wilson, 2001). Apart from this, biodiversity is especially suitable as a model context for ESD, as it shows the interrelations of economic, social and ecological factors particularly well (Menzel & Bögeholz, 2009; van Weelie, 2002). Moreover, global interrelations become especially evident in the context of biodiversity: causes for biodiversity loss are mostly global. At the same time, extinction becomes evident on a local scale, and not equally distributed throughout the entire world. In order to describe the regions in the world where biodiversity is extremely high and at the same time acutely at risk, 34 biodiversity hotspots have been defined (Mittermeier et al., 2004). Central Chile is a region that contains such a biodiversity hotspot.

Agenda 21 calls for educational programmes that are both locally relevant and culturally appropriate (UNCED, 1992a; article 36). Thus, for example, cultural differences in the perception of biodiversity loss are important determinants for successful educational programmes aiming at awareness building. Moreover, such an intercultural approach could be useful for promoting a (global) biodiversity protection strategy in that it exemplarily reveals different perceptions of biodiversity and its loss. Addressing this subject, Menzel and Bögeholz (2009) compared pupils living at the biodiversity hotspot Chile and German pupils in their perception of biodiversity loss. As a result of the qualitative study, they found that Chilean pupils seemed to have problems in recognising social and economic triggers for a local resource dilemma (a situation in which natural resources are overused for economic interest, often to fulfil basic needs) that leads to the depletion of a local medical plant. Given this result, it would be fair to assume that pupils at a biodiversity hotspot and those living in an industrial country also differ in their commitment to become active in biodiversity protection. Albeit so, an intercultural perspective on factors that influence young peoples' commitments to protect biodiversity has not been reported to date. Yet, such research could contribute to designing of educational interventions that are both, locally relevant and culturally appropriate.

Theoretical Framework

In the field of environmental psychology and environmental education research, various attempts have been made to explain commitments to protect the environment by drawing upon socio-psychological theories. For example, the Norm-Activation-Model (NAM) (Schwartz & Howard, 1981; Schwartz, 1977) suggests a focus on moral values and personal norms to explain altruistic behaviour; i.e. behaviour that reflects an unselfish concern for the welfare of others. Apart from altruistic behaviour, the NAM has also shown to be promising to predict environmentally friendly behaviour (e.g. Guagnano, Dietz, & Stern, 1994; Hopper & Nielsen, 1991; Stern, Dietz, & Kalof, 1993; Widegren, 1998). However, for explaining commitment to environmentally significant behaviour, additional factors might be relevant besides those that the NAM assumes. Taking such additional factors into account, Stern and his colleagues have developed the Value-Belief-Norm-Theory (VBN) to explain commitments to protect the environment (Stern et al., 1993; Stern, Dietz, Abel, Guagnano, & Kalof, 1999; Stern, 2000). Within the VBN-theory, the inclusion of values, of the beliefs 'awareness of consequences' and 'ascription of responsibility' and of personal norms is directly deduced from predictors and mediators of the NAM (Schwartz, 1977; Schwartz & Howard, 1981).

According to the NAM, an altruistic value orientation is a basic factor that shows positive influence on altruistic behaviour. Notwithstanding, within the VBN theory, altruistic, biospheric and egoistic value orientations can predict pro-environmental behaviour (e.g. Stern et al., 1993; Stern, Dietz, Kalof, & Guagnano, 1995a; Stern et al., 1999; Stern, 2000). This means that, besides altruistic values, values that foster an unselfish concern towards nature (biospheric) and values that foster a concern for one's own life and that of one's family (egoistic) can be conductive for pro-environmental behaviour. Value orientations have repeatedly been measured in four clusters of the ten universal human values after Schwartz (1992, 1994). Each of the existing four clusters is composed of one to three related values out of a total of ten single values defined (Schwartz, 1992, 1994). The clusters 'conservation' and 'self-enhancement' represent an egoistic value orientation, while the clusters 'openness to change' and 'self-transcendence' represent biospheric-altruistic value orientations. All clusters could, theoretically, serve as positive predictors for pro-environmental behaviour. Nevertheless, on an empirical basis, the research literature indicates the positive influence of biospheric and altruistic values which have shown to dominate in

predicting pro-environmental behaviour (e.g. Guiterrez Karp, 1996; Schultz & Zelezny, 1999). Especially the value 'universalism', which is part of the value cluster self-transcendence, explicitly draws upon positive values towards nature as it embodies value preferences such as "understanding appreciation, tolerance and protection for the welfare of all people and for nature" (Schwartz et al., 2001, p. 521). Thus, it is likely that especially the single value 'universalism' would show a positive influence on pro-environmental behaviours, when Schwartz values are tested individually (instead of clusters).

Within the VBN theory, three different beliefs are assumed to be influential on commitments to pro-environmental behaviour, all of them positively. One relevant belief, explicitly included in the VBN theory, is the New Environmental Paradigm (NEP) (Dunlap & van Liere, 1978; Dunlap, van Liere, Mertig, & Jones, 2000), which Stern, Dietz and Guagnano (1995b) interpret as a positive 'folk' ecological theory about the relationship of humanity and nature. Within the VBN theory, the NEP is included as an indicator of pro-environmental beliefs. The NEP has frequently been described as being conducive for a commitment to protect nature (e.g. for an overview see Dunlap et al., 2000; Schultz & Zelezny, 1999; Stern et al., 1995b; Stern et al., 1999). However, with regard to intercultural comparisons including Latin American and 'Western' samples, existing empirical data is ambiguous. Some authors report lower scores in Latin American samples (e.g. Johnson, Bowker, & Cordell, 2004), others describe people with a Latin American background to be more connected with nature (Lynch, 1993) or more 'ecologically attuned' (Noe & Snow, 1990) to explain higher NEP scores in respective samples (e.g. Schultz, Unipan & Gamba, 2000). For the context of pupils who live close to a biodiversity hotspot in Chile, we would expect the latter.

Besides the NEP, the VBN theory includes beliefs about egoistic, altruistic and biospheric consequences of an environmental problem. Here again, all three notions of an awareness of consequences (egoistic, altruistic, and biospheric) can theoretically foster pro-environmental behaioural commitments. The assumption that an awareness of egoistic consequences is conducive for pro-environmental behaviour is based on rational-choice theories that focus on subjective individual benefit as the driving force for behavioural decisions (e.g. Ajzen, 1991). Empirically, awareness of altruistic and biospheric consequences have been shown to be related (Stern & Dietz, 1994). However, Schultz (2001) succeeded in distinguishing an awareness of egoistic, altruistic and biospheric consequences on an empirical basis. A perceived ability to reduce threat and an ascription of responsibility to protect nature are the third and fourth beliefs assumed to be relevant beliefs to explain pro-environmental behaviour; especially an ascription of responsibility has been shown to be influential on pro-environmental behaviours in empirical studies (Kaiser, Wölfing, & Fuhrer, 1999; Kaiser & Shimoda, 1999).

Personal norms form the third main block of predictors in the VBN theory apart from values and beliefs. According to the underlying NAM, personal norms are strongly related to behaioural commitments. This strong relation has also been reported in contexts of pro-environmental behaviour (e.g. Bamberg & Möser, 2007; Stern et al., 1995a; Stern et al., 1999; Stern, 2000; Widegren, 1998). Thus, it is fair to assume that personal norms will be highly influential on pro-environmental behavioural commitments.

There are many facets of pro-environmental behaviour, all of which can be motivated by quite different psychological factors. Thus, the VBN-theory differentiates four behavioural commitments. These are: i) activism, such as participating in public demonstrations, ii) non activist, public-sphere behaviour, such as signing a petition to demand nature protection, iii) private-sphere behaviour, such as purchase decisions and iv) behaviour in organizations; such as fostering recycling policies in the working environment.

In a study with German pupils, Menzel and Bögeholz (2008) successfully chose predictors from the VBN theory to explain commitments to protect biodiversity of German adolescents. The results showed that personal norms and a value orientation towards the Schwartz value 'universalism' proved to be highly relevant. However, an intercultural perspective on the issue has not yet been taken.

Research Questions and Hypotheses

As we found three out of the four behavioural commitments, as suggested by the VBN theory, especially relevant for adolescents, we decided to explain pupils' commitment to i) activism, ii) non activist, public-sphere behaviour and iii) private-sphere behaviour. Our hypotheses and the research question represent two basic foci: Firstly, Chilean and German pupils shall be compared in their values, beliefs, norms and different behavioural commitments to protect biodiversity. Thus, we investigate differences between the two samples that might be due to Chilean pupils' proximity to the biodiversity hotspot (H1-H3). Secondly, we would like to identify positive and negative predictors that explain pupils' commitment to protect biodiversity in both samples (H4-H5; research question).

> H1: Chilean pupils show higher awareness of egoistic consequences of biodiversity loss than the pupils in the German sample.
>
> H2: Chilean pupils score higher on the NEP than the German pupils.
>
> H3: Chilean pupils show higher personal norms and commitments to protect biodiversity than the pupils in the German sample.
>
> H4: Among the tested values, the universal human value 'universalism' will show the strongest influence on either commitment to protect biodiversity, in both samples.
>
> H5: Personal norms are the strongest predictors for a commitment to protect biodiversity in both samples.

Besides these hypotheses, we addressed the following research question:

> • What other predictors are relevant to explain commitments to pro-environmental behaviour besides those hypothesized?

Methods

The VBN theory explains a general commitment to pro-environmental behaviour. However, our research interest was, more specifically, an investigation of commitments to protect biodiversity. Therefore, we generated a model based on the VBN theory and adjusted it to the context of biodiversity (see Figure 1). We then used the model as a basis for a questionnaire study. Due to the chosen context, the items of most scales were designed to explicitly focus on biodiversity.

For all predictors, we either drew scales from original literature or constructed scales based on approved scales and adapted them to the context of biodiversity (see Table 1). Two scales were used in their original form, without explicitly referring to a biodiversity context. The first scale that we applied in its original form was the Portrait Values Questionnaire (PVQ, Schwartz, 2005). The PVQ measures the ten universal human values after Schwartz (1992, 1994), eight of which are analyzed in the current paper (see Figure 1).
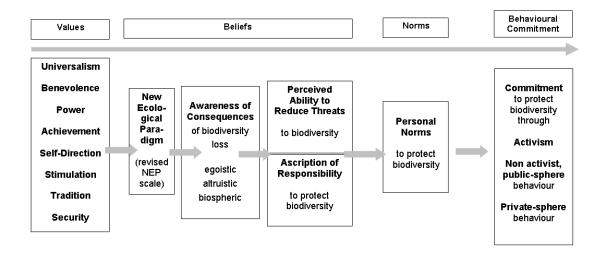
Figure 1. Model to explain adolescents' commitment to protect biodiversity, based on the Value-Belief Norm theory (Stern et al., 1995a; Stern et al., 1999; Stern, 2000).

The second scale that we did not alter from the original was the NEP, which was published in its revised form, the New *Ecological* Paradigm, in 2000 (Dunlap et al., 2000). For the scales of perceived ability to reduce threats to biodiversity and ascription of responsibility to protect biodiversity, no approved templates could be deduced from the literature. The respective scales were, therefore, newly designed. All other scales were constructed after templates from the literature. Even though those scales were contextualized with regard to biodiversity, we carefully constructed new items as closely as possible to the original as to ensure the best possible comparability of our results with existing data. Moreover, the authors chose contexts that are equally relevant for adolescents in both countries and both males and females (such as medical plants that are produced from wild growing plants). The scales to measure an awareness of egoistic, altruistic and biospheric consequences of biodiversity loss were constructed after Stern et al. (1993). For example, one original item to measure an awareness of egoistic consequences was 'Protecting the environment will threaten jobs for people like me' (Stern et al., 1993, p. 333). Our equivalent item was 'The protection of biodiversity will diminish my future job opportunities', now explicitly representing the context of biodiversity and the life context of an adolescent. Items to measure personal norms refer to guilt feelings and, therefore, explicitly to the conscience as suggested by Widegren (1998) and Stern et al. (1999). An example is 'I feel guilty if I don't contribute to the protection of local biodiversity'. Items to measure behavioural commitments were constructed after Stern et al. (1995a) and Stern (2000), representing commitments to activism, non activist, public-sphere behaviour and private-sphere behaviour.

For the PVQ, approved German and Spanish versions exist. The NEP scale was translated from English into German using the back-translation method. All other items were newly designed in German. After that, the German template was translated into Spanish by a native speaker who is also fluent in German. Again, the translation was verified by a back-translation. Disagreements in translation were dispatched by consensus. Before we applied the questionnaires, one author invited pupils in both countries to discuss all items with her. During these discussions, the author felt that the items are perceived equally by German and Chilean pupils.

Table 1. Scales as used in the study

	Scale	Sources	No. of Items	Cronbach's Alpha Chilean sample	Cronbach's Alpha German sample
Values	Self-Direction	Portrait Values Questionnaire (PVQ) (Schwartz, 2005)	4	0.59	0.57
	Power		3	0.60	*0.42*
	Universalism		6	0.76	0.78
	Achievement		4	0.76	0.80
	Security		5	0.67	0.68
	Stimulation		3	0.66	0.64
	Tradition		4	0.54	*0.48*
	Benevolence		4	0.68	0.63
Beliefs	NEP	The Revised NEP Scale (Dunlap et al., 2000), translated	15	0.54	0.71
	Awareness of Egoistic Consequences	Constructed after Stern et al. (1993, 1999)	3	*0.33*	*0.40*
	Awareness of Altruistic Consequences		3	0.53	0.60
	Awareness of Consequences for the Biosphere		3	0.58	0.56
	Perceived Ability to Reduce Threat	New construction	8	0.79	0.85
	Ascription of Responsibility		8	0.74	0.86
Norms	Personal Norms	Constructed after Stern et al. (1999), Widegren (1998)	8	0.88	0.90
Behavioural Commitment	Activism	Constructed after Stern (2000), Stern et al. (1999)	4	0.70	0.83
	Non Activist, Public-Sphere Behaviour		4	0.55	0.65
	Private-Sphere Behaviour		4	0.72	0.76

The questionnaire was applied in November 2005 to 216 Chilean and in January 2006 to 217 German pupils aged 15-19. For data collection, we provided supervising teachers with a detailed information sheet on how to apply the self-administered questionnaire. Before the questionnaire was applied, pilot studies took place, during which one researcher was present. During the piloting the comprehensibility of the items was assessed by recording all questions and comments of the participating pupils. After that, some items were slightly changed to make the questionnaire easier to understand. The data of the pilot studies were not included in the final data file.

All German participants were enrolled in the 11th grade of grammar schools and all Chilean pupils the *'tercero medio'* (third year out of four years of secondary education). In both countries, neither the subject 'biodiversity' nor 'ecology' had as yet been treated during the test persons' secondary education. In both countries we tried to diversify the sample as well as possible. For instance, in Germany we included schools from rural as well as from urban areas. Pupils from both weak and strong socioeconomic backgrounds constituted the sample. In Chile, we included schools that are free of charge as well as expensive private schools in order to ensure an inclusion of pupils from different socioeconomic backgrounds. However, and especially due to the relatively small sample size, we cannot claim our sample to be representative, neither of each respective country's pupils, nor of the German or Chilean society. Apart from this, please bear in mind that our sample consists of secondary school pupils and, thus, of pupils who were mostly successful learners.

We assessed all possible predictors through scales that contained a minimum of three Items (see Table 1). Alpha values ranged between 0.53 and 0.90 except for the 'Schwartz'-values tradition ($\alpha = 0.48$) and power ($\alpha = 0.42$) in the German sample, and for awareness of egoistic consequences in both samples ($\alpha = 0.40$ in the German sample; $\alpha = 0.33$ in the Chilean sample). All scales were four-point Likert-scales that ranged from 'I do not agree' to 'I fully agree'. The only exception was the Portrait Values Questionnaire (PVQ, Schwartz, 2005) used for assessing value orientations. Here, a six-point Likert-scale was applied, in which pupils were asked to rate how much a hypothetical person is like them. Categories ranged from 'very similar' to 'very dissimilar'.

To compare the Chilean and the German sample, we calculated independent group t-tests although some variables did not follow a normal distribution. However, t-tests are relatively robust against broken assumptions, such as non-normal distributions (Delaney & Vargha, 2000). Nevertheless, we validated our results with a U-Test. As a result, the same variables proved to be significant although effect sizes generally decreased. For group comparisons of PVQ variables, Schwartz (2005) strongly suggests the use of 'centred values' in order to avoid individual or cultural biases. The scores for one scale can be centred by subtracting the mean score of an individual across the entire respective scale from each of the same individual's score for a subscale (Schwartz, 2005).

In order to test hypotheses four and five (H4 and H5) and to answer the research question, we conducted regression analyses in two analytical steps. Due to the high number of predictors, regression models would run the risk of high co-linearity. In order to avoid this, sets of predictors were used within a first analysis (I). Firstly, we used all eight Schwartz values as predictors. Then, secondly, we used beliefs, and, within another regression model, personal norms as exclusive predictors. These three sets of predictors (one for values, one for beliefs, and one for personal norms) were regressed on each behavioural commitment. In a second step (analysis II) only those predictors were included that had proven to be significant as a result of analysis I. This means, for analysis II, we constructed one regression model across all relevant predictors identified within the three predictor sets as tested in analysis I. Again, we conducted analysis II for each tested behavioural commitment.

Results

Hypotheses one to three (H1-H3) focused on comparisons of Chilean and German pupils. The results of independent group t-tests are reported in Table 2.

Three values differed significantly between the two groups, even though effect sizes were small (i.e. d< 0.50): self-direction (d= 0.21), universalism (d= -0.37) and tradition (d= -0.45). Note that Chilean pupils scored higher on universalism and tradition, while German pupils scored higher on self-direction. Regarding beliefs, all variables differed significantly between the two samples, apart from awareness of altruistic consequences (d= -0.15; t= *n.s.*). For the NEP, differences were significant, but showed rather small effects (d= 0.49). Note, however, that the NEP was the only scale (except for some centred value scores) with a lower mean score for Chilean pupils (mean Chile: 1.92; mean Germany: 2.11). The effect size for the difference in an awareness of egoistic consequences was medium (d= -0.71), the difference in an ascription of responsibility slightly higher (d= -0.72).

Regarding personal norms and the three types of behavioural commitment, Chilean pupils, again, scored significantly higher. Effect sizes were medium throughout (d= -0.71 for non activist, public-sphere behaviour; d= -0.73 for private-sphere behaviour, and d= -0.74 for personal norms), and large in the case of activism (d= -1.18).

A second focus was the identification of relevant predictors to explain Chilean and German pupils' commitment to protect biodiversity through activism, non activist, public-sphere behaviour and private-sphere behaviour (H4, H5 and the research question). The results of the regression analyses (analysis I and analysis II) for the Chilean sample are depicted in Table 3 and for the German sample in Table 4 respectively. All β-values are standardized beta coefficients.

For the Chilean sample, personal norms proved to be the most important predictor for all three analyzed types of commitment to protect biodiversity (β-values ranged between 0.54 and 0.62 in analysis I and between 0.44 and 0.48 in analysis II; p< 0.001 in all cases). Besides personal norms, security (β= 0.12; p< 0.05) and ascription of responsibility (β= 0.14; p< 0.05) had a positive influence on a commitment to activism. In contrast, for non activist, public-sphere behaviour, the value tradition (β= 0.14; p< 0.05) was the only positive predictor besides personal norms. On a commitment to private-sphere behaviour, the NEP (β= 0.12; p< 0.05) and a perceived ability to reduce threats (β= 0.20; p< 0.01) had a positive influence. For the Chilean sample, the value universalism showed no significance in analysis II. However, in analysis I, universalism had slight positive predictive power for activism (β= 0.22; p< 0.05).

In the German sample, personal norms were also highly significant (p< 0.001) for each type of commitment to protect biodiversity across all analyses (analysis II: β= 0.41 for activism, β= 0.27 for non activist, public-sphere behaviour, β= 0.27 for private-sphere behaviour). However, the universalism value showed a similar high relevance and was a marginally stronger predictor than personal norms in the regression models for non activist, public-sphere behaviour (β= 0.32; p< 0.001) and private-sphere behaviour (β= 0.28; p< 0.001). In analysis II, besides universalism and personal norms, security (β= -0.13; p< 0.05) and ascription of responsibility (β= 0.13; p< 0.05) were relevant predictors for commitment to activism (note that security had a negative influence). To explain non activist, public-sphere behaviour, in analysis II only the NEP (β= 0.16; p< 0.05) was significant with a positive influence apart from personal norms and universalism. Three predictors explained private-sphere behaviour besides universalism and personal norms: Self-direction (β= 0.16; p< 0.05) had positive influence, while stimulation served as a negative predictor (β= -0.22; p< 0.001). Perceived ability to reduce threats to biodiversity was the only 'beliefs-'predictor for this commitment type, which again was found to be positive (β= 0.17; p< 0.01).

Table 2. Comparison between means of the German and Chilean sample, all mean scores based on 4-pt. Likert scales (except values)

Predictor	Mean Chile	SE Chile	Mean Germany	SE Germany	T/p	Effect size d
Values (centred values)						
Self-Direction	0.46	0.04	0.60	0.05	2.13*	0.21
Power	-0.89	0.07	-0.95	0.07	-0.60 *n.s.*	-0.06
Universalism	0.47	0.04	0.20	0.06	-3.79***	-0.37
Achievement	0.03	0.06	0.03	0.06	-0.05 *n.s.*	-0.01
Security	-0.18	0.05	-0.04	0.05	1.90 *n.s.*	0.18
Stimulation	0.14	0.05	0.17	0.06	0.31 *n.s.*	0.03
Tradition	-0.39	0.05	-0.78	0.06	-4.65***	-0.45
Benevolence	0.46	0.04	0.55	0.05	1.36 *n.s.*	0.13
Beliefs						
NEP	1.92	0.03	2.11	0.03	5.10***	0.49
Awareness of Egoistic Consequences	1.34	0.04	0.98	0.03	-7.34***	-0.71
Awareness of Altruistic Consequences	2.06	0.03	1.98	0.04	-1.60 *n.s.*	-0.15
Awareness of Consequences for the Biosphere	2.49	0.03	2.32	0.03	-3.53***	-0.34
Perceived Ability to Reduce Threat	2.19	0.04	1.76	0.05	-6.89***	-0.66
Ascription of Responsibility	2.14	0.04	1.69	0.05	-7.52***	-0.72
Personal Norms						
Personal Norms	1.67	0.05	1.10	0.05	-7.67***	-0.74
Behavioural Commitment						
Activism	1.72	0.05	0.78	0.05	-12.19***	-1.18
Non Activist, Public-Sphere Behaviour	1.97	0.05	1.45	0.05	-7.40***	-0.71
Private-Sphere Behaviour	2.02	0.05	1.44	0.06	-7.50***	-0.73

*= p<0.05, **= p<0.01, ***= p<0.001; NEP= New Ecological Paradigm; d>0.2= small effect; d>0.5= medium effect; d>0.8= large effect

Table 3. Results of regression analyses for the Chilean sample (n= 216). Predictors for analysis II were selected as a result of analysis I, where regressions were conducted separately by values, beliefs, and personal norms. All figures (except shaded) are standardized β-coefficients.

Criterion → Predictor ↓	Activism		Non Activist, Public-Sphere Behaviour		Private-Sphere Behaviour	
	I	II	I	II	I	II
Values						
Self-Direction	*n.s.*		*n.s.*		0.17*	*n.s.*
Power	*n.s.*		*n.s.*		*n.s.*	
Universalism	0.22*	*n.s.*	*n.s.*		*n.s.*	
Achievement	*n.s.*		*n.s.*		*n.s.*	
Security	0.26**	0.12*	*n.s.*		*n.s.*	
Stimulation	*n.s.*		*n.s.*		*n.s.*	
Tradition	*n.s.*		0.18*	0.14*	*n.s.*	
Benevolence	*n.s.*		*n.s.*		*n.s.*	
R^2 (model I)	0.22		0.18		0.13	
adj. R^2 (model I)	0.19		0.15		0.10	
F (model I)	7.14		5.68		3.91	
Beliefs						
NEP	*n.s.*		*n.s.*		0.14*	0.12*
AC egoistic	0.21**	*n.s.*	0.22**	*n.s.*	0.14*	*n.s.*
AC altruistic	*n.s.*		*n.s.*		*n.s.*	
AC biospheric	*n.s.*		*n.s.*		*n.s.*	
Perceived Ability to Reduce Threat	0.25**	*n.s.*	*n.s.*		0.32***	0.20**
Ascription of Responsibility	0.27***	0.14*	0.18*	*n.s.*	*n.s.*	
R^2 (model I)	0.29		0.15		0.21	
adj. R^2 (model I)	0.27		0.13		0.19	
F (model I)	14.10		6.28		9.18	
Norms						
Personal Norms	0.62***	0.45***	0.54***	0.44***	0.58***	0.48***
R^2 (model I)	0.38		0.29		0.33	
adj. R^2 (model I)	0.38		0.29		0.33	
F (model I)	130.67		87.28		105.70	
R^2 (model II)		0.47		0.32		0.40
adj. R^2 (model II)		0.45		0.31		0.38
F (model II)		30.16		24.88		27.20

*= p<0.05, **= p<0.01, ***= p<0.001

AC= Awareness of Consequences; NEP= New Ecological Paradigm

Table 4. Results of regression analyses for the German sample (n= 217). Predictors for analysis II were selected as a result of analysis I, where regressions were conducted separately by values, beliefs, and personal norms. All figures (except shaded) are standardized β-coefficients.

Criterion → Predictor ↓	Activism		Non Activist, Public-Sphere Behaviour		Private-Sphere Behaviour	
	I	II	I	II	I	II
Values						
Self-Direction	n.s.		n.s.		0.24**	0.16*
Power	n.s.		n.s.		n.s.	
Universalism	0.54***	0.28***	0.51***	0.32***	0.54***	0.28***
Achievement	n.s.		n.s.		n.s.	
Security	-0.16*	-0.13*	n.s.		n.s.	
Stimulation	n.s.		n.s.		-0.25***	-0.22***
Tradition	n.s.		n.s.		n.s.	
Benevolence	n.s.		n.s.		n.s.	
R² (model I)	0.29		0.31		0.38	
adj. R² (model I)	0.26		0.29		0.36	
F (model I)	10.38		11.80		16.00	
Beliefs						
NEP	0.19**	n.s.	0.22**	0.16*	0.21**	n.s.
AC egoistic	n.s.		n.s.		n.s.	
AC altruistic	n.s.		n.s.		n.s.	
AC biospheric	n.s.		n.s.		0.15*	n.s.
Perceived Ability to Reduce Threat	n.s.		n.s.		0.21**	0.17**
Ascription of Responsibility	0.35***	0.13*	0.28***	n.s.	0.29***	n.s.
R² (model I)	0.26		0.29		0.36	
adj. R² (model I)	0.24		0.27		0.35	
F (model I)	12.15		14.52		19.84	
Norms						
Personal Norms	0.61***	0.41***	0.53***	0.27***	0.57***	0.27***
R² (model I)	0.38		0.28		0.33	
adj. R² (model I)	0.37		0.28		0.32	
F (model I)	127.85		85.32		104.10	
R² (model II)		0.46		0.43		0.55
adj. R² (model II)		0.45		0.42		0.53
F (model II)		35.83		40.21		30.91

*= p<0.05, **= p<0.01, ***= p<0.001

AC= Awareness of Consequences; NEP= New Ecological Paradigm

Discussion and Educational Implications

In the first hypothesis (H1) we stated that Chilean pupils would show a higher awareness of egoistic consequences compared to the German pupils. Our data clearly supports this hypothesis. This result can be explained by a more direct consternation of Chilean pupils who observe the loss of biodiversity in their everyday life (e.g. the clearing of endemic *Nothofagus* forests for the sake of *Pinus* plantations). A recently published qualitative study with Chilean and German pupils showed that Chilean pupils were able to name numerous local plant and animal species under threat, while German pupils seldom did so, which also indicates a higher concern for local biodiversity among Chilean pupils (Menzel & Bögeholz, 2009). Note, however, that alpha-values for the scale of awareness of egoistic consequences were low for both samples (cf. Table 1) and our results should, therefore, be interpreted tentatively. Chilean pupils also showed higher awareness of consequences for the biosphere than German pupils. Here again, the direct observation of nature destruction could be conducive for the result. It is interesting that in both groups, an awareness of consequences for the biosphere is higher than an awareness of egoistic and altruistic consequences. Apparently, in both samples, pupils have a strong belief in biodiversity loss harming the environment rather than harming humans. This result can be interpreted in two directions: On the one hand, pupils may believe that consequences for nature itself are more dramatic than consequences for humans. On the other hand, consequences for nature might simply appear more plausible to them. In fact, it is difficult to understand how the destruction of nature directly affects humans' life as causes and consequences are often non-linear. Moreover, the poorest among the human population, and not pupils of our sample, will most likely suffer most from the destruction of natural resources. This might be difficult to imagine for our test persons. For this reason, in the context of ESD, an enhancement of role-taking to achieve empathy is an important issue (de Haan, 2006; Scott & Gough, 2003) and should be pronounced through respective educational activities (such as simulation games).

In hypothesis two (H2) we assumed higher scores of Chilean pupils on the NEP due to their proximity to a biodiversity hotspot. In fact, Chilean pupils scored higher on all scales – except for the NEP. Thus, hypothesis two has to be clearly rejected. The lower scores of Chilean pupils on the NEP are consistent with some reports in literature comparing Latin American samples to 'Western' samples (Johnson et al., 2004). Respectively, contrary reports on people with a Latin American cultural background scoring higher on the NEP (e.g. Schultz et al., 2000) can not be supported by our data. Note, however, that the NEP is a general measure for a belief in the connectedness of humanity and nature. Therefore, with regard to the context of biodiversity, the NEP does not provide us with information on a general belief of a connectedness of man and biodiversity.

Hypothesis three (H3) expressed our assumption that Chilean pupils would show higher personal norms and commitments to protect biodiversity. Our data fully supports this hypothesis. Higher personal norms in relation to the commitment to protect biodiversity in the Chilean sample might, again, be due to their direct observation of biodiversity loss. The high scores of Chilean pupils on the scale for an ascription of responsibility to reduce threat to biodiversity support this interpretation. Nevertheless, in practice, environmental protection is only slowly gaining public interest in most Latin American countries including Chile (Rieckmann, 2004). It is therefore fair to assume that most Chilean pupils in our sample did not have experiences in environmental protection. Thus, we should also consider that Chilean pupils might not see the actual efforts to be invested for pro-environmental behaviour. An agreement during a written test such as our questionnaire is easier when the actual effort is underestimated. In contrast to the Chilean pupils, German pupils might be desensitized to environmental protection and other problems,

such as youth unemployment, superpose environmental issues on pupil's list of concerns (Hur-relmann, Albert, & TNS Infratest, 2006).

The comparably low commitment of German pupils to protect biodiversity through activism supports the findings of a recent study which repeated that young Germans prefer private activities (such as purchase decisions) to activism in order to protect the environment (Greenpeace, 2005). For Chilean pupils the same might be true in that although a commitment to protect biodiversity through activism was clearly higher in the Chilean sample, activism was again the type of commitment that displayed the lowest approval. Protecting the environment through activism sometimes includes involvement in rather illegal activities, such as climbing fences of companies that harm the environment, or at least such activities that demand high personal commitment. The items in our questionnaire reflect such activities and might, therefore, represent a form of behavioural commitment that is most difficult to agree with.

Interestingly, Chilean pupils responded more positively on almost all scales. Exceptions were the 'self-direction' value, the NEP and an awareness of altruistic consequences, where the difference was not significant. An explanation could be a potential cultural bias reflected by a positive response tendency of the Chilean sample. However, effect sizes are mostly medium or large, which is unlikely to be due to a response tendency alone. We would therefore assume that more positive responses really reflect a higher concern and commitment on behalf of the Chilean pupils even so, small effect sizes in difference between the groups should not be over-interpreted as we cannot definitely exclude the possibility of a slight response tendency.

In hypothesis four (H4) we assumed that the value 'universalism' would be the strongest predictor for all four assessed behavioural commitments. According to our results, hypothesis four is fully supported by data generated by the German sample. A positive influence of a cluster of Schwartz values that universalism belongs to has repeatedly been shown for pro-environmental behaviour (e.g. Gutierrez Karp, 1996; Schultz & Zelezny, 1999). This result is understandable given that the universalism value embodies elements such as 'justice', and 'respect and appreciation of nature'.

The strong influence of universalism calls for educational programmes that foster such a value orientation. Human values, however, develop early and are then stable and difficult to change (e.g. Rokeach, 1973). Yet, options are early educational programmes in kindergartens or primary schools. If such programmes succeed in drawing children's attention to the beauty of nature, foundations for an universalism value orientation can be built. For example, Lindemann-Matthies (2006) has shown how a programme to foster the recognition of plant species along young children's school path contributed to an appreciation of biodiversity. For adolescents, biodiversity education could build upon the universalism value by focusing on aspects such as justice and solidarity. These are important questions surrounding the topic of biodiversity, especially when the use and overuse of natural resources are picked out as a theme for curricula. Such programmes could then strengthen the universalism value in those pupils, who already show a disposition for a 'universalism' value orientation.

Hypothesis five (H5) focused on the role that personal norms play to explain pro-environmental behavioural commitments in both samples. We stated that, according to the NAM, personal norms would have the highest predictive power for all behavioural commitments. Within the NAM, personal norms are defined as, 'self-expectations for specific actions in particular situations that are constructed by the individual' (Schwartz, 1977, p. 227). It is evident that such a self-expectation is an important precondition for showing pro-environmental behaviours, a result that has also been reported in other studies (Stern et al., 1995a; Stern et al., 1999; Stern, 2000; Widegren, 1998). Albeit so, our hypothesis can only be supported by the Chilean sample data. On the one hand, personal norms were extremely important for predicting all commitment

types in both samples. On the other hand, in the German sample, the 'universalism' value proved to be an even stronger predictor for the commitments to non activist, public-sphere behaviour and private-sphere behaviour. This result underlines the strength of universalism as a predictor in the German sample.

According to our data, the most promising strategy for fostering a commitment to protect biodiversity would, thus, be the strengthening of personal norms. However, the strong relationship between personal norms and behavioural commitments suggests that influencing factors for both, norms and commitments could be similar. Therefore, it is useful to consider the values and beliefs which proved to be relevant in order to deduce educational implications.

With respect to our research question, we can conclude that more predictors proved to be relevant besides those hypothesized. For instance, Chilean pupils' commitment to non activist, public-sphere behaviour is predicted by the tradition value. Interestingly, tradition has been described as a negative predictor for pro-environmental behaviour (Stern et al., 1995a), which contradicts our finding. The tradition value is defined as 'respect, commitment and acceptance of customs and ideas that traditional culture or religion provide the self' (Schwartz et al., 2001, p. 521). At first glance, our results suggest that certain traditional values in Chile foster a commitment to protect biodiversity. However, a possible explanation could also be that the 'tradition' value supports this special type of commitment, i.e. non activist behaviour in the public sphere.

Moreover, regarding values, the positive influence of the 'security' value on commitment to activism is interesting, as it served as a negative predictor in the German sample. This finding suggests that Chilean pupils probably note a risk to security through biodiversity loss, while this is not the case in the German sample. This result again supports the argument of Chilean pupils' personal consternation.

A commitment to private-sphere behaviour by Chilean pupils can be predicted by their perceived ability to reduce threat apart from the influence of personal norms. It therefore seems as if realistic options to contribute to biodiversity protection are important for fostering a commitment to private-sphere behaviour. In general, the central motive for Chilean pupils seemed to be their personal concern and dismay. It would, therefore, be helpful to point out potential consequences of biodiversity loss on a local level. Nonetheless, educators should not solely confront pupils with the issue of biodiversity loss and then leave them concerned and helpless (Nagel, 2005). Rather, a perceived ability to reduce threat should be encouraged in parallel to developing realistic behavioural perspectives, and hence empower them to take action. Such educational measures could, once pupils notice what they can contribute, at the same time strengthen learners' feelings of responsibility towards biodiversity protection. If pupils know what they can contribute, they will more likely be willing to become active. This means that in educational practice, developing local and effective behavioural options should be one major target. Ideally, such options would be developed together with the learner, so that the developed actions are plausible and authentic to her or him.

In the German sample, the security value played a negative role to predict activism. A possible explanation is that those pupils who appreciate a secure life situation would rather not participate in potentially dangerous activities such as tagging a protest banner to the outside of a company. However, the positive role of the self-direction value for a commitment to private-sphere behaviour indicates that pupils appreciate making their own choices, which in turn, serves as a motivation for biodiversity protection.

The negative influence of stimulation on private-sphere behaviour is more difficult to explain. One possibility is that some German pupils may judge private-sphere behaviour to protect nature to be bourgeois. Our items for private-sphere behaviour also referred to contexts such as remaining on a trail during hiking or a commitment to allow weeds to grow in a part of one's

garden. Especially pupils who feel a strong wish to experience a stimulating life might not perceive such behaviour as being attractive. Rather, those pupils would avoid behaviours that they consider to be bourgeois or narrow-minded. Educators should honestly consider if behavioural options are attractive for teenagers – and accept, if this is not the case.

Regarding beliefs, the NEP and ascription of responsibility played a certain role for each behavioural type in the German sample, at least in analysis I. A general conviction of humans' and nature's interdependence as expressed by the NEP has been described as being conducive for a commitment to protect nature (e.g. Dunlap et al., 2000; Schultz & Zelezny, 1999; Stern et al., 1995b) and should be focused on in educational programmes.

Ascription of responsibility as a positive predictor can be explained by the logic that those who feel responsible for the protection of biodiversity will also show a higher commitment to do so. Most likely, only those will feel responsible to protect biodiversity who actually see the influence of their own behaviour on sustaining natural resources. Examples are well-reflected purchase decisions as suggested by Brower and Leon (1999) and Davidson and Hatt (2005). When pupils carefully investigate the ecological and social impacts of their own choices as a consumer, it might become realistic – and attractive – to them to reconsider their behaviour. Reflective processes can be supported by tools such as calculating one's 'ecological footprint' (Kitzes, Peller, Goldfinger, & Wackernagel, 2007). Such reflection would be a valuable starting point to exemplify concrete and effective behavioural perspectives. It could foster young people's feelings of responsibility by pointing out that one can *really* contribute to sustaining biodiversity.

Acknowledgements

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology, 27*(1), 14-25.

Brower, M., & Leon, W. (1999). *The consumer's guide to effective environmental choices: Practical advice from the Union of Concerned Scientists*. New York, Random House.

Davidson, D. J., & Hatt, K. C. (Eds.) (2005). *Consuming sustainability*. Halifax, Fernwood Publishing.

Delaney, H., & Vargha, A. (2000, April). *The effect of nonnormality on Pupil's two sample t-Test*. Paper presented at the American Educational Research Association. New Orleans, Lousiana.

Dunlap, R. E., van Liere, K. D., Mertig, A. G., & Jones R. E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues, 56*(3), 425-442.

Dunlap, R. E., & van Liere, K. D. (1978). The New Environmental Paradigm. *The Journal of Environmental Education, 9*(4), 10-19.

Greenpeace (2005). *Jugend und Umwelt*. Hamburg, Greenpeace, Emnid.

Guagnano, G. A., Dietz, T., & Stern, P. C. (1994). Willingness to pay for public goods: A test of the contribution model. *Psychological Science, 5*(6), 411-415.

Gutierrez Karp, D. (1996). Values and their effect on pro-environmental behavior. *Environment and Behavior, 28*(1), 111-133.

de Haan, G. (2006). The BLK '21' programme in Germany: a 'Gestaltungskompetenz'-based model for Education for Sustainable Development. *Environmental Education Research*, *12*(1), 19-32.

Hopper, J. R., & Nielsen, J. M. (1991). Recycling as altruistic behavior: Normative and behavioral strategies to expand participation in a community recycling program. *Environment and Behavior, 23*(2), 195-220.

Hurrelmann, K., Albert, M., & TNS Infratest (2006). *15. Shell Jugendstudie - Jugend 2006*. Frankfurt a.M, Fischer.

Johnson, C. Y., Bowker, J. M., & Cordell, K. H. (2004). Ethnic variation in environmental belief and behaviour: An examination of the new ecological paradigm in a social psychological context. *Environment and Behavior, 36*(2), 157-186.

Kaiser, F. G., Wölfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology,19*(1), 1-19.

Kaiser, F. G., & Shimoda, T. A. (1999). Responsibility as a predictor of ecological behaviour. *Journal of Environmental Psychology,19*(3), 243-253.

Kitzes, J., Peller, A., Goldfinger, S., & Wackernagel, M. (2007). Current methods for calculating national ecological footprint accounts. *Science for Environment & Sustainable Society*, *4*(1), 1-9.

Lindemann-Matthies, P. (2006). Investigating nature on the way to school: responses to an educational programme by teachers and their pupils. *International Journal of Science Education, 28*(8), 895-910.

Lynch, D. (1993). The garden and the sea: U.S. Latino environmental discourses and mainstream environmentalism. *Social Problems, 40*(1), 108-124.

Menzel, S., & Bögeholz, S. (2009). The loss of biodiversity as a challenge for Sustainable Development: How do pupils in Chile and Germany perceive resource dilemmas? *Research in Science Education, 39*(4), 429-447.

Menzel, S., & Bögeholz, S. (2008). Was fördert eine Bereitschaft von Oberstufenschüler(inne)n, die Biodiversität zu schützen? Eine standardisierte Befragung in Anlehnung an die Value-Belief-Norm-Theorie. *Umweltpsychologie, 12*(2), 105-122.

Mittermeier, R. A., Robles, G. P., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C. G., Lamoreux, J., & da Fonseca, G. A. B. (2004). *Hotspots revisited*. Mexico, CEMEX.

Nagel, M. (2005). Constructing apathy: How environmentalism and Environmental Education may be fostering 'learned hopelessness' in children. *Australian Journal of Environmental Education, 21*(1), 71-80.

Noe, F. P., & Snow, R. (1990). Hispanic cultural influence on environmental concern. *The Journal of Environmental Education, 21*(2), 27-34.

Rieckmann, M. (2004). *Lokale Agenda 21 in Chile*. München: Ökom Verlag.

Rokeach, M. (1973). *The nature of human values*. New York: Free Press.

Schultz, W. P. (2001). The structure of environmental concern: concern for self, other people, and the biosphere. *Journal of Environmental Psychology, 21*(4), 327-339.

Schultz, W. P., Unipan, J. B., & Gamba, R. J. (2000). Acculturation and ecological worldview among Latino Americans. *The Journal of Environmental Education, 31*(2), 22-27.

Schultz, W. P., & Zelezny, L. (1999). Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology, 19*(3), 255-265.

Schwartz, S. H. (2005). Robustness and fruitfulness of a theory of universals in individual human values. In A. Tamayo & J. Porto (Eds.), *Valores e comportamento nas organizacões* (pp. 56-95). Petrópolis, Vozes.

Schwartz, S. H., Melech, G., Lehmann, A., Burgess, S., Harris, M., & Owens, V. (2001). Extending the cross-cultural validity of the theory of basic human values with a different method of measurement. *Journal of Cross-Cultural Psychology, 32*(5), 519-542.

Schwartz, S. H. (1994). Are there universal aspects in the structure and contents of human values? *Journal of Social Issues, 50*(4), 19-45.

Schwartz, S. H. (1992). Universal structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in Experimental Social Psychology, 25*(1), 1-65.

Schwartz, S. H., & Howard, J. A. (1981). A normative decision-making model of altruism. In P. J. Rushton & R. M. Sorrentino (Eds.), *Altruism and helping behaviour: Social, personality, and developmental perspectives* (pp. 189-211). Hillsdale, Erlbaum.

Schwartz, S. H. (1977). Normative influence on altruism. In L. Berkowitz (Ed.), *Advances in Experimental Psychology* (Vol. 10. pp. 222-275). New York, San Francisco, London, Academic Press.

Scott, W., & Gough, S. (Eds.). (2003). *Sustainable development and learning. Framing the issues.* London, New York: Routledge Falmer.

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behaviour. *Journal of Social Issues, 56*(3), 407-424.

Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A Value-Belief-Norm Theory of support for social movements: The case of environmentalism. *Research in Human Ecology, 6*(2), 81-97.

Stern, P. C., Dietz, T., Kalof, L., & Guagnano, G. A. (1995a). Values, beliefs, and proenvironmental action: Attitude formation toward emergent attitude objects. *Journal of Applied Social Psychology*, *25*(18), 1611-1636.

Stern, P. C., Dietz, T., & Guagnano, G. A. (1995b). The New Ecological Paradigm in social-psychological context. *Environment and Behavior, 27*(6), 723-743.

Stern, P. C., & Dietz, T. (1994). The value basis of environmental concern. *Journal of Social Issues, 50*(3), 65-84.

Stern, P. C., Dietz, T., & Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and Behavior, 25*(3), 322-348.

UNCED (United Nations Conference on Environment and Development) (1992a). *Agenda 21*. Rio de Janeiro, UNCED.

UNCED (United Nations Conference on Environment and Development) (1992b). *Convention on Biological Diversity (CBD)*. Rio de Janeiro, UNCED.

van Weelie, D. (2002). Making biodiversity meaningful through environmental education. *International Journal of Science Education, 24*(11), 1143-1156.

Widegren, Ö. (1998). The New Environmental Paradigm and personal norms. *Environment and Behavior, 30*(1), 75-100.

Wilson, E. O. (2001). *The diversity of life. 2nd edition.* London, Penguin.

WCED (World Commission on Environment and Development) (1987). *Our common future*. Oxford, Oxford University Press.

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Şilili ve Alman öğrencileri biyolojik çeşitliliğinin korunmasına adanmışlık hususunda teşvik eden değerler, inançlar ve normlar

Susanne Menzel ve Susanne Bögeholz

Genç insanların biyolojik çeşitliliğin korunması konusundaki adanmışlığını desteklemek, hem endüstrileşmiş ülkeler hem de biyolojik çeşitlilik açısından önemi tespit edilmiş alanlarda sürdürülebilir kalkınma için eğitimin önemli bir amacıdır. Fakat bu türden sorumlulukları etkileyen faktörleri tanımlayan çok az deneysel kanıt mevcuttur . Bu çalışmada, Değer-İnanç-Norm teorisine dayanarak 15-19 yaşları arasındaki 216 Şilili ve 217 Alman öğrenci biyoceitlilik konusundaki sorumluluklari araştırılmıştır. Karşılaştırmalar Şilili öğrencilerin daha yüksek kişisel değer ve biyolojik çeşitliliği korumaya adanmışlığa sahip olduğunu göstermiştir. Regresyon analizi sonuçları da Alman örneklemi için "Scwartz-değer evrenselinin üç farklı davranışsal adanmışlık için önemli bir prediktör olduğunu ortaya koymuştur. Her iki örneklemde de sorumluluğun yüklenmesi, tehdidi azaltan algılanmış kabiliyet ve hepsinden önemlisi kişisel değerler olumlu prediktörlerdir. Makale, sonuçların var olan kanıtların ışığında tartışılması ve biyolojik çeşitlilik eğitimi için etkilerine yönelik önerilerle neticelendirilmiştir.

Anahtar kelimeler: Değer-İnanç-Norm Teorisi, Şili, Almanya, biyolojik çeşitlilik eğitimi, davranışsal adanmışlık