How many young generations are there? – A typology of teenagers’ climate change awareness in Germany and Austria

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How many young generations are there? – A typology of teenagers’ climate change awareness in Germany and Austria

Alina Kuthe a, Lars Keller a, Annemarie Körfgen a, Hans Stötter a, Anna Oberrauch b and Karl-Michael Höferl a

a Department of Geography, University of Innsbruck, Innsbruck, Austria; b Centre for Subject Didactics, Pedagogical University Tyrol, Innsbruck, Austria

ABSTRACT

Under the premise that the young generation of teenagers cannot be considered to be uniform, this study identified groups of teenagers based on their level of climate change awareness. Questionnaires answered by 760 teenagers (13–16 years old) from Germany and Austria were analyzed using a hierarchical cluster analysis. The teenagers were assigned to four groups that differed as to their cognitive, affective and conative aspects of climate change awareness. Based on the empirical results, the authors argue that there are different subgroups of young people in terms of climate change awareness, which climate change education should take into consideration.

Introduction and background of the study

Climate change is one of the greatest challenges currently facing the world and it will continue to be for the foreseeable future. If the international community is to meet this challenge, action must be taken now and in all parts of society. It is necessary accordingly to raise society’s awareness of climate change, as awareness shapes and influences people’s engagement in the creation of a climate-friendly society (WBGU, 2011). Special focus should be devoted to teenagers (Moser, 2010), being the generation whose lives will be more affected by climate change than any generation before (Ojala, 2012). As future decision makers, they will be responsible for dealing with the environmental and societal consequences of climate change (Corner et al., 2015; Ojala & Lakew, 2017). To equip young people with what they need to analyze and address climate change, the enhancement of teenagers’ climate change knowledge, attitudes, and behavior has become one of the main aims of environmental education (Carmi, Arnon, & Orion, 2015; Izadpanahi, Elkadi, & Tucker, 2017; Ojala, 2015). Further, many studies in environmental education research have been conducted in an effort to evaluate how climate change awareness and its factors can be strengthened. These studies show consistently that if climate change education has the aim to strengthen climate change awareness, it is crucial to adapt climate change education, its content, frame, and method, to the particular conditions of the respective target group (Moser & Dilling, 2011; Zaval & Cornwell, 2017). The importance of learners’ preconditions are also emphasized in numerous—mainly constructivist—learning theories, e.g., Piaget (Ginsburg & Opper, 1979) and Bruner (Bruner, 1956). Payne (1998) stresses the need to understand young peoples’ conceptions of nature in order to understand what they need in environmental education.

In sum, one of the most important rules of climate change education is to know the audience and to tailor the education program to their preconditions. However, numerous studies (Calmbach, Borgstedt,
Borchard, Thomas, & Flaig, 2016; Michelsen, Grunenberg, Mader, & Barth, 2015) have already shown that adolescents differ in their sociocultural background, values, interests, etc. Thus, this study assumes that these differences can also be found regarding their climate change awareness and that these differences should be taken into consideration in climate change education. Therefore, this study analyzes the differences in teenagers’ climate change knowledge, attitudes as well as behavior, and identifies different groups of teenagers based on their climate change awareness.

Relevant aspects of climate change awareness for developing the typology

A few factors determine and describe the engagement of young people in the creation of a climate-friendly society. Together, these factors are often summarized by using the term climate change awareness (e.g., Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015; The UNESCO Climate Change Initiative, 2010). In this regard, however, the term awareness is used in very inconsistent ways, with various classifications and connotations (Karpudewan, Roth, & Abdullah, 2014; Lee et al., 2015; Metag, Füchslin, & Schafer, 2015). In this study a broad understanding of climate change awareness is used, comprising cognitive, affective, and conative aspects. The following five aspects were considered.

Knowledge

Whether teenagers are able and willing to contribute to creating a climate-friendly society depends on their knowledge of climate change and its causes and effects (Hines, Hungerford, & Tomera, 1986/1987; Kollmuss & Agyeman, 2002; Metag et al., 2015). This knowledge is crucial to making informed and well-considered decisions about one’s behavior (Taber & Taylor, 2009).

Climate-friendly behavior

Teenagers play an important role in creating a climate-friendly society. They can change their behavior and behave in a more climate-friendly manner in their everyday lives. Although some actions may be considered to be outside the teenagers’ scope of behavior (such as choosing to drive an electric car instead of a fossil fuel car or voting for a climate-friendly political party), it is important to encourage them to change their lifestyle to reduce their carbon footprint (Corner et al., 2015; Metag et al., 2015).

Multiplicative actions

In addition, teenagers can be engaged as multipliers for climate change awareness or so-called change agents, for example, when they tell their family about the project at home or tell their friends in their free time activities. As a study by Hiramatsu, Kurisu, Nakamura, Teraki, and Hanaki (2014) shows, teenagers influence the climate change awareness of their parents and friends.

Attitude

A few studies have exhibited a so-called knowledge-behavior gap (Boyes & Stanisstreet, 2012; Kollmuss & Agyeman, 2002; Moser & Dilling, 2011), which means that they could not ascertain the direct interaction between knowledge and behavior. This gap exists because behavior is also influenced by having a positive attitude toward climate change and toward taking action. A positive attitude comprises, for example, the perception of one's ability to change one's behavior (self-efficacy), the feeling that a change in behavior has a positive impact on the degree of climate change (the locus of control) (Kollmuss & Agyeman, 2002) or one's sense of responsibility (Ernst, Blood, & Beery, 2017; Hines et al., 1986/1987).

Personal concern

An additional factor contributing to engagement in the creation of a climate-friendly society is how concerned individuals feel about climate change. People who feel that they are or will be affected by
climate change in their present or future lives (e.g., a perceived threat from natural disasters) are more likely to engage in climate-friendly actions than those who do not feel affected (Boyes & Stanisstreet, 2012; Metag et al., 2015).

**Aim of the study**

This study aims to identify the different groups of teenagers and their different conditions and needs regarding climate change awareness. Thus, the following question guided the study: Which different groups of young people can be distinguished based on their level of climate change awareness and its different aspects? The results may contribute and help to improve climate change education in particular and environmental education in general, as the results help to developed new target-group specific learning settings, which comply with the different conditions of young people. The theoretical framework applied by this article to explore these empirical findings is mainly based on the hypothesized model of environmental literacy components of Teksoz, Sahin, and Tekkaya-Oztekin (2012). This model comprises five factors: knowledge, attitude, concern, responsibility, and activity, all components influencing each other.

**Method and data**

**Measurement instrument**

Our data were collected by means of an online questionnaire that surveyed the starting conditions with regard to the climate change awareness of the teenagers in the project. The questionnaire consists mainly of closed questions (Likert scale items) and a few open questions. In addition to demographic items (age, gender, etc.), the questionnaire includes items that capture the following five different factors of climate change awareness (Table 1):

- The aim of this study was not to test or estimate the construct of attitude but to integrate a wide spectrum of aspects within the cluster-analysis. Thus, in this study attitude is used in a broad understanding including affective, behavioral, and cognitive components, for example like those used in Fishbein and Ajzen (2010), Kraus (1995), Eilam & Trop (2012). This is why attitude consists of different beliefs and attitudes such as interest in the topic of climate change, willingness to act, internal and external locus of control, and the felt responsibility to act in a climate-friendly manner.
- In order to capture the personal concern of young people caused by climate change, three items were used that cover concern in their own lives, of their family and of people in Europe;
- Teenagers’ knowledge of the causes and effects of climate change was measured by four different items that capture the teenagers’ factual knowledge;
- Climate-friendly behavior was captured through eight items concerning different actions aimed at reducing one’s carbon footprint. Thereby, the items only refer to actions that are in the young people’s scope of action;
- Multiplicative action was measured through four items that ask how often the young people talk about climate change and climate-friendly behavior with family and friends and how often they try to convince them to act in a climate-friendly manner.

**Participants**

Data were collected within the k.i.d.Z.21-Austria project (k.i.d.Z. is an acronym for “kompetent in die Zukunft” or “competent into the future” in English). The project pursues the aim of strengthening teenagers’ awareness of climate change.

All teenagers in the k.i.d.Z.21-Austria project had to fill in an online questionnaire before participating in the project. The questionnaires were completed at the beginning of the project in September and October 2015 and 2016. The school made all teenagers available for the survey except those who were not allowed to take part by their parents. The survey took place within a regular school lesson, supervised
Table 1. Items used in the study.

<table>
<thead>
<tr>
<th>Source:</th>
<th>Description</th>
<th>M</th>
<th>SD</th>
<th>SR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attitude: Interest, Responsibility, Locus of Control</strong>&lt;br&gt;(item 1: 1 = very uninterested, 6 = very interested; items 2-5: 1 = I totally disagree, 6 = I totally agree)</td>
<td></td>
<td></td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>1. How interested are you in the topic “climate change”?</td>
<td>4.09</td>
<td>1.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. It is my responsibility to act in a climate-friendly manner.</td>
<td>4.92</td>
<td>1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I am able to contribute to reducing the degree of climate change.</td>
<td>4.60</td>
<td>1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. If the international community cooperates, global warming can be limited to + 2–4 °C.</td>
<td>4.75</td>
<td>1.36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I would like to reduce my carbon emissions.</td>
<td>4.59</td>
<td>1.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal Concern</strong></td>
<td></td>
<td></td>
<td>0.92</td>
<td></td>
</tr>
<tr>
<td>In your opinion, to what extent are the following areas affected by climate change?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. my life</td>
<td>3.23</td>
<td>1.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. the life of my family</td>
<td>3.19</td>
<td>1.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. the life of people living in Europe</td>
<td>3.84</td>
<td>1.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td>about causes and effects of climate change In your opinion, are the following statements right or wrong?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Due to climate change, temperature will rise in all areas in the world an equal amount.</td>
<td>3.48</td>
<td>1.93</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The melting of the glaciers will stop immediately if worldwide CO₂-emissions come to a halt.</td>
<td>4.23</td>
<td>1.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Winter tourism in the Alps is not affected by climate change thanks to the use of snow guns.</td>
<td>4.32</td>
<td>1.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Climate change is mainly human induced.</td>
<td>4.92</td>
<td>1.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Multiplicative Action</strong></td>
<td></td>
<td></td>
<td>0.83</td>
<td></td>
</tr>
<tr>
<td>How often do the following statements apply to you?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I discuss climate change with my friends.</td>
<td>2.35</td>
<td>1.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I discuss climate change with my family.</td>
<td>2.95</td>
<td>1.53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I try to influence my friends to act in a climate-friendly manner.</td>
<td>2.51</td>
<td>1.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I try to influence my family to act in a climate-friendly manner.</td>
<td>2.94</td>
<td>1.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Climate-friendly Behavior</strong></td>
<td></td>
<td></td>
<td>0.79</td>
<td></td>
</tr>
<tr>
<td>How often do the following statements apply to you?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I turn down the heating when I am not at home.</td>
<td>4.09</td>
<td>1.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I try to repair things before I buy something new.</td>
<td>4.46</td>
<td>1.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Before I buy something, I carefully consider whether I need it or not.</td>
<td>4.15</td>
<td>1.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I prefer to buy things with little packaging.</td>
<td>3.50</td>
<td>1.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I turn off electrical devices when I do not need them.</td>
<td>4.51</td>
<td>1.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. While taking a shower I do not run the water unnecessarily.</td>
<td>4.81</td>
<td>1.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I separate waste to promote the sustainable reuse of material resources.</td>
<td>4.81</td>
<td>1.42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I turn off lights when I do not need them.</td>
<td>5.11</td>
<td>1.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

M = Mean; SD = Standard Deviation; SR = Scale Reliability measured by Cronbach’s alpha N = 766.

by a teacher who had been instructed by the project team. Those teenagers who were not available when the data were collected in school filled in an online questionnaire at home.

The sample, which is not representative, consists of 792 teenagers between 13 and 16 years of age from 14 different A- and B-level schools in Germany and Austria; 53% of the respondents were female and 47% male. Cases with missing answers were excluded from further analysis, leaving 766 valid responses.

**Statistical analysis**

First, in order to create a robust base for a concise cluster analysis, the dimensions of the variables were pooled into fewer scales. For this purpose, a principal component analysis was carried out using SPSS Statistics 24 and a varimax rotation with Kaiser normalization (Fabrigar & Wegener, 2012; Field, 2011).

Items with loadings below .4 or that load on multiple components were removed. Cronbach’s alpha was computed to assess the internal reliability of each scale (Cortina, 1993). By means of a principal component analysis, it was possible to identify five scales describing climate change awareness and the aspects thereof, as shown in Table 1. Almost all scales have values between .70 and .92 and can be regarded as at least “acceptable.” Only the score representing knowledge is lower and has to be assessed as “questionable” (Gliem & Gliem, 2003).

Based on these scales, a two-step hierarchical cluster analysis was conducted to identify groups of students with distinct profiles regarding climate change awareness. In the next step, the single-linkage
method was used to identify the outliers in the dendrogram. Six students had to be excluded from the sample and are not considered in the following analysis. The remaining 760 students were then clustered using Ward's method and Thorndike's elbow method to find the best number of clusters (Thorndike, 1953). To validate the solution, a discriminant analysis was carried out. This shows a rate of 84% of correctly predicted cases (Everitt, 2011; Kaufman & Rousseeuw, 2005).

Results

Based on the five scales presented in the method section, a cluster analysis was performed that supports a four-cluster solution, as shown in Figure 1. In comparing the groups and their level of awareness (see Figure 1), it is apparent that the groups differ greatly among all five factors. Two of the clusters are more toward the middle, comprising 54% of the teenagers, whereas the remaining teenagers belong to two more extreme groups, one with a very high level of awareness and one with a very low level of awareness. The group with the highest level of awareness was named the Concerned Activists, as they had highest scores in all the scales, except Knowledge. The members of the Charitables had the second highest level of awareness and the Paralyzed had a slightly lower score than the Charitables. The Disengaged formed the cluster with the lowest level of awareness of climate change.

The biggest group, named the Charitables \((N = 305, 40\%)\), comprises 56% girls and 44% boys. The members of this group are the best informed and they know more than the others about climate change and its causes and effects (see Table 2). Although they have the lowest level of concern, they behave in a climate-friendly manner in their everyday lives. To sum up, the Charitables are distinguished by their selfless behavior and accept the fact that climate change is happening, although they feel less concerned than some in regard to their present lives.

The Paralyzed \((N = 103, 14\%)\) are the smallest cluster and contain the highest number of girls (59%). Regarding their concern and willingness to act, they are the opposite of the Charitables: they feel very concerned, but they neither engage in climate-friendly behavior nor in multiplicative actions (cf. Table 2). Overall, the members of this group give the impression that they feel affected by climate change, and they are overwhelmed by the issue. They do not want to change anything because they feel helpless and believe that changing their behavior will not help.

The Concerned Activists \((N = 158, 21\%)\) have the highest level of awareness of climate change and the highest score in all variables except knowledge. They are the most concerned about climate change and they try to convince friends and family to do the same (cf. Table 2). But although they are motivated to act and feel concerned, they know little about climate change and its causes and effects. This group is

Proportion of the teenagers surveyed in the four groups

![Figure 1](Proportion of the teenagers surveyed in the four groups)
Table 2. The four clusters and their characteristics in the five different dimensions.

<table>
<thead>
<tr>
<th></th>
<th>The Paralyzed</th>
<th>The Charitables</th>
<th>The Disengaged</th>
<th>The Concerned Activists</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (% of the Sample)</td>
<td>103 (14%)</td>
<td>305 (40%)</td>
<td>194 (25%)</td>
<td>158 (21%)</td>
</tr>
<tr>
<td>Attitude: Interest, Responsibility, Locus of Control</td>
<td>−0.30</td>
<td>0.11</td>
<td>−0.42</td>
<td>0.51</td>
</tr>
<tr>
<td>Personal Concern</td>
<td>0.84</td>
<td>−0.24</td>
<td>−0.88</td>
<td>1.00</td>
</tr>
<tr>
<td>Multiplicative Actions</td>
<td>−0.65</td>
<td>0.21</td>
<td>−0.56</td>
<td>0.71</td>
</tr>
<tr>
<td>Climate-friendly Behavior</td>
<td>−0.44</td>
<td>0.20</td>
<td>−0.32</td>
<td>0.31</td>
</tr>
<tr>
<td>Knowledge</td>
<td>−0.05</td>
<td>0.21</td>
<td>−0.36</td>
<td>0.07</td>
</tr>
</tbody>
</table>

N = 760, the lowest and highest scores per scale above are highlighted in bold.

56% female and 44% male. Compared to the other groups, the Concerned Activists are the group most engaged in the issue of global warming. They perceive themselves as the concerned generation even today and see themselves as having an active role in creating a climate-friendly society.

The fourth cluster, the Disengaged (N = 194, 25%) is the only group with more males (51%) than females (49%). They do not feel concerned about climate change in their own lives (M = −0.85, SD = .76) and are not willing to act (M = −.52, SD = 1.13). They do not behave in a climate-friendly manner or talk about climate change with their friends and family (cf. Table 2). Furthermore, they are also distinguished by not knowing much about climate change. However, the Disengaged show more internal variation than the other groups, which means that they are more heterogeneous. In summary, they are the most unaware group because they are not interested in the issue or in engaging in a societal solution to managing climate change.

Discussion and implications

The aim of this study was to identify groups of teenagers based on their level of climate change awareness. A cluster analysis showed that the surveyed teenagers can be clustered into four different groups that differ as to cognitive, affective, and conative aspects of climate change: the Paralyzed, the Charitables, the Concerned Activists, and the Disengaged.

The findings of this study are relevant to more than just the scientific community as they make a noteworthy contribution to climate change education programs by providing information about the different groups, their characteristics regarding different aspects, and how they could be addressed in this regard. The smallest group, the Paralyzed, are concerned about climate change but are not willing to act in a climate-friendly manner because they question their ability to have an impact. Perhaps their feelings of self-efficacy could be strengthened by underlining their sphere of influence and making them aware of relevant concrete actions in their everyday lives, especially those that can be realized on an individual basis (Anderson, 2012). Furthermore, it could help to inform them of some climate-friendly initiatives in their surroundings in order to show them that they are part of a group and can take advantage of group dynamics (Ockwell, Whitmarsh, & O’Neill, 2009; Zaval & Cornwell, 2017). Another idea might be to use public commitments in climate change education as a tool to promote climate-friendly behavior and make it more visible (Barata, Castro, & Martins-Loução, 2017). Further Aguilar (2018) has found out that Community Environmental Education can help to strengthen teenagers’ self-efficacy and thus contributes to the efficacy of the whole groups’ actions.

The Concerned Activists form the group that are already aware of the issue and willing to act. Their only weakness is their relatively low level of knowledge about climate change. Therefore, it could be beneficial to build up their knowledge about this issue by providing reliable information based on scientific facts in order to enable them to take part in social discourse and make informed decisions (Taber & Taylor, 2009). Regarding such, knowledge of the complex spatial and temporal relations in climate change is important (Flottum, Dahl, & Rivenes, 2016). Ideally, this knowledge is communicated by trustworthy messengers such as scientists (Corner et al., 2015; Moser, 2010). Özdem, Dal, Öztürk, Sönmez, and Alper (2014) have shown that the media is an important source of information for many teenagers. Thus, media could also be a useful tool in educational programs in providing valuable and useful knowledge. Some studies have shown that peer learning and intergenerational learning can be a
promising approach in environmental education (Williams, McEwen, & Quinn, 2017; Vreede, de Warner, & Pitter, 2013). Andersen (2018) showed, for example, that using a negotiated protocol, in which the family members commit themselves to environmental goals for the next three months, supported the students to lead intergenerational environmental change at home. With regard to such, the Concerned Activists have the potential to engage as environmental leaders or role models (Arnold, Cohen, & Warner, 2009). However, before doing so, they should be provided with extensive knowledge to make sure that they do not share incorrect information.

The Disengaged are not really skeptical about climate change, but they are notable for maintaining distance from the issue. Hence, it would be interesting to learn more about the group, especially why they feel so disengaged. One assumption could be that other issues are more pressing and immediate than climate change in their everyday lives, such as finding a job or other global problems (Corner et al., 2015; Pidgeon, 2012). It could prove effective to frame the relevance of climate change in ways so as to connect it to other issues in their daily lives. Another approach addressing this group might be to reach them through peer education, as social influence from peers has been identified as especially effective in environmental engagement (Eames, Barker, & Scarff, 2018; Ojala, 2012; Vreede, de Warner, & Pitter, 2013). Furthermore, it might be a good idea to address them in more unusual formats such as music, drama, or video games (Ojala & Lakew, 2017). What is more, as Rooney-Varga, Brisk, Adams, Shuldman, and Rath (2014) suggest, teenagers could develop and produce their own public service announcements as another tool in climate change education. The Disengaged are not interested in the issue, so it is questionable whether they should be singled out in communication programs or if climate change communication should focus on the other groups. Therefore, it would be interesting to better identify the composition of this group to ascertain if a part of the group can still be reached.

The biggest group, termed the Charitables, are already quite willing to act, although they do not feel concerned in their everyday lives, which seems to be a good starting point. For this group it might be possible to focus especially on local and tangible aspects of climate change, such as the effects in their everyday or future lives. Regarding such, it is promising to connect these effects to young peoples’ experience to reduce the psychological distance of climate change (McDonald, 2016). Also, it might be interesting to learn more about what they would need to be more active, i.e., the factors preventing them from belonging to the Concerned Activists group.

In summary, these findings show the different types of teenagers’ awareness and thus the variety of their strengths and needs. As a result of this empirical analysis, we can say: Every group has its own needs and preconditions that should be met in environmental education. Given these results, it seems even more important to discuss how the different groups can be addressed in climate change education. Is it necessary to address each group through their own projects and learning approaches tailored to their specific needs? Or is it possible to offer openness in learning and learning processes, in which learning starts from every individual’s own interests, needs, and strengths and in which every group and even every individual gains what he or she needs? These challenges can be met by connecting the contents to the questions and interests of young people and offering various methodological approaches. The concept of moderate constructivism presents one possible framework for applying these learning environments (Cakir, 2008).

Although this study is not directly comparable to previous typologies of adults in Germany (Metag et al., 2015) because we could not use the same items, a few analogies seem to be interesting, especially when comparing adults in Germany with the teenagers in our study. First, the two more extreme groups, the Concerned Activists and the Disengaged, can be identified in both studies. In both cases, slightly more teenagers than adults belong to these two groups. This indicates that teenagers tend to be slightly more extreme than adults in both directions. Second, the Paralyzed (14%) in the study on teenagers and the Cautious (28%) in the study on adults evidenced many similarities as they are both concerned but not willing to act (Metag et al., 2015). However, two groups among the adults could not be identified among the teenagers, i.e., the Doubtful and the Alarmed, whereas the Charitables could not be identified among the adults (Metag et al., 2015).

These finding are in line with some recent studies (e.g., Albert, Hurrelmann, & Quenzel, 2015; Metag et al., 2015; Michelsen et al., 2015; Ratter, Philipp, & Storch, 2012 ), which also identified a segmentation
in society regarding climate change awareness or environmental awareness. For example, a study by Calmbach et al. (2016) clusters the young people of Germany into seven groups according to their living conditions, values, and education. Taking up this typology, a study by Michelsen et al. (2015) determined that the members of these groups differ as to their environmental attitudes. Some studies have already demonstrated various segmentations in society regarding climate change awareness among adults, e.g., “Global Warming’s Six Americas” (Leiserowitz, Maibach, & Light, 2009) and “Global Warming’s Five Germanys” (Metag et al., 2015).

Nevertheless, these results should be confirmed in future studies, especially in respect of ensuring a larger and more representative sample. Based on the sample of teenagers participating in the study, a group restricted to persons involved in the k.i.d.Z.21-Austria project, we have to allow for the possibility that there may have been a positive selection bias within the sample. This is because the teenagers participating in these projects have teachers who are more aware of climate change, as they are taking part in the project voluntarily and perhaps devote greater attention to this topic in school than other teachers (Duarte, Escario, & Sanagustín, 2017).

Another interesting finding of this study is that the share of males and females differs among the four groups. Although they do not differ significantly as to their proportion in each group, this finding is an interesting contribution to the issue of gender differences and climate change awareness (as investigated in, for example, Sakellari and Skanavis (2013) and Dijkstra and Goedhart (2012)). In two groups, i.e., the Paralyzed and the Charitables, the share of girls is slightly higher, whereas in the Disengaged and Concerned-Activist groups the observed share of girls is lower than expected. These findings are in line with recent studies, for example, that of Arora-Jonsson (2011), who argues that women are more vulnerable and virtuous in relation to the environment than men and as a result are more concerned. Another conclusion is that boys tend to be more extreme than girls.

This study raises a few new interesting questions for future studies. A particularly interesting question is which factors determine membership in a specific cluster. Based on the results of Michelsen et al. (2015), one assumption might be that socioeconomic background plays an important role in one's group affiliation. Teenagers whose parents are well educated and have a high social status might be more interested in sustainable development issues and the environment (Michelsen et al., 2015, Stevenson, Peterson, & Bondell, 2017). Therefore, it would be interesting and useful to analyze how the socioeconomic status or education of teenagers’ parents determine their group affiliation. Further Braun, Cottrell, and Dierkes (2018) have shown that also the teenagers’ cultural background influences their environmental attitudes, knowledge and behavior. Some studies have also shown a link between positive nature experiences in childhood and a pro-environmental attitude (Cheng & Monroe, 2012), so this might also be a factor influencing teenagers’ climate change awareness and group. Furthermore, this study has other limitations regarding the sample as it was conducted among teenagers from Austria and Germany, so it could be interesting to extend this study to young people from other countries or of different ages. Another interesting line of research would be to analyze how the young people in the different groups identified in projects such as k.i.d.Z.21-Austria.

To be able to adapt climate change education to the conditions of young people, this study classified 760 teenagers in Austria and Germany in four groups, based on their climate change awareness. The results underline the necessity of climate change education, which is able to consider and integrate the various preconditions the teenagers have. With the aim to use the strengths of the individual groups and to consider their preconditions in climate change education to prepare the young generation for the challenges of climate change.

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