Individual and Collective Self-Efficacy Beliefs on Climate Change—Development of an Item-Based Instrument (SEB-CC) and Exploration of the Factorial Structure Among School Students and Future Geography Teachers

Individuelle und kollektive Selbstwirksamkeitsüberzeugungen zum Klimawandel – Entwicklung eines item-basierten Instrumentes (SEB-CC) und Exploration der faktoriellen Struktur bei Schülerinnen und Schülern und zukünftigen Geographielehrkräften

Creencias individuales y colectivas de autoeficiencia sobre el cambio climático – Desarrollo de un instrumento basado en ítems (SEB-CC) y exploración de la estructura factorial entre estudiantes y futuros profesores de geografía

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Zusammenfassung Selbstwirksamkeitsüberzeugungen sind ein wichtiger Prädiktor für Umwelthandeln. Für das hochrelevante Thema Klimawandel fehlen jedoch bisher zuverlässige und valide Instrumente zur Erfassung der individuellen und kollektiven Selbstwirksamkeitsüberzeugungen. Deshalb wurden Items entwickelt und bei Geographielehramtsstudentinnen und -studenten ($n = 141$) sowie bei Schülerinnen und Schülern am Ende der Sekundarstufe I ($n = 154$) eingesetzt. Nach der Analyse der Itemkennwerte wurde die faktorielle Struktur untersucht. Die Ergebnisse zeigen für die beiden Gruppen unterschiedliche latente Strukturen, welche jedoch jeweils sinnvoll interpretierbar sind. Damit stehen erste Instrumente für die weitere Forschung zur Verfügung.

Schlüsselwörter individuelle Selbstwirksamkeitsüberzeugungen, kollektive Selbstwirksamkeitsüberzeugungen, Klimawandel, Itementwicklung, explorative Faktorenanalyse

Abstract Self-efficacy beliefs are an important predictor of environmental actions. However, to date, there has been a lack of reliable and valid instruments for assessing individual and collective self-efficacy beliefs on the crucial topic of climate change. Therefore, items were developed and used with university students of geography (future geography teachers, $n = 141$) and students at the low end of secondary school ($n = 154$). After analyzing item characteristics, the factorial structure was examined. The results show different latent structures for the two groups, though each can be meaningfully interpreted. Thus, initial instruments are now available for further research.

Keywords individual self-efficacy beliefs, collective self-efficacy beliefs, climate change, item development, exploratory factor analysis

Resumen Las creencias de autoeficiencia son un importante factor predictivo del comportamiento medioambiental. Sin embargo, siguen faltando instrumentos fiables y válidos para registrar las creencias de autoeficiencia individuales y colectivas en relación con un tema tan relevante como es el cambio climático. Por ello, se han desarrollado una serie de ítems orientados a estudiantes de geografía ($n = 141$) y alumnos de final del primer ciclo de secundaria ($n = 154$). Tras analizar las características de los ítems, se examinó la estructura factorial. Los resultados muestran estructuras latentes diferentes para los dos grupos, pero que pueden interpretarse de forma significativa en cada caso. Todo ello proporciona instrumentos iniciales para futuras investigaciones.

Palabras clave creencias individuales de autoeficiencia, creencias colectivas de autoeficiencia, cambio climático, desarrollo de ítems, análisis factorial exploratorio

1. Introduction

In recent years, anthropogenic climate change (hereafter abbreviated as CC) has represented a huge social challenge (IPCC, 2023). It is also highly relevant in the educational context, as it is a key problem with global significance (Klafki, 2007). In this context, geography education with its spatial, systemic character, analysis of human–environment interactions and solution-oriented approach (DGfG, 2022; German Geographical Society, 2014) is of particular importance. The relevance of CC extends beyond the obvious competence areas of subject knowledge and spatial orientation. Instead, all areas of competence mentioned in the German educational standards must play a role in CC education. In addition to *subject-specific knowledge* and *spatial orientation*, listed areas of competences include *acquisition of knowledge/methodology*, *communication*, *evaluation*, and *action* (German Geographical Society, 2014). Action, or the willingness to act, is of particular importance. However, the state of research on the predictors of climate-friendly actions is heterogeneous. Some studies showed that accurate knowledge is a strong predictor of behavioral intentions (Bord et al., 2000) or concern (Shi et al., 2016). In terms of knowledge type, there are indications that action-related knowledge and effectiveness knowledge are particularly relevant to environmentally friendly behavior (Frick et al., 2004). In contrast, the importance of knowledge in a meta-study falls behind other aspects, such as descriptive norms, negative affect (such as fear or anger), and perceived self-efficacy beliefs (van Valkengoed & Steg, 2019). Findings from environmental education research point in a similar direction, indicating that knowledge alone is insufficient to prompt environmentally conscious actions (Kollmuss & Agyeman, 2002; Riess, 2003). In addition, with respect to CC, it must be stated that more knowledge about climate issues does not automatically translate to more climate awareness (Busch et al., 2019; Tasquier & Pongiglione, 2017) and that mere information on CC is not sufficient to establish climate awareness

or generate climate action (Grothmann, 2017, p. 224). Even positive attitudes towards environmental protection do not lead to environmentally responsible behavior in a linear way (Eilam & Trop, 2012). Rather, environment-related actions are influenced by a variety of factors (Grothmann, 2017) that are also interrelated in many ways. One of these factors—along with knowledge, social norms, and others—is self-efficacy beliefs or self-efficacy expectations (hereafter abbreviated as SEB), which can be traced back to Bandura's (1977) social cognitive theory. SEB is thought to reduce defensive reactions and increase the willingness to take action on issues, including CC (Grothmann, 2018). This is of particular importance because the global and serious threats posed by CC and the simultaneously high demands of avoidance and adaptation strategies may result in defensiveness, excessive demands, and even feelings of powerlessness—either in the sense of not being able to do more or not being able to do enough (Gifford, 2011; Grothmann, 2017). At the same time, given the global dimension of CC, it clearly poses a challenge to both individuals and the community as a whole (Jugert et al., 2016). Thus, both individual (Kellstedt et al., 2008) and shared (or collective) SEB (Bandura, 1997; Thaker et al., 2016), play an important role.

Strikingly, there are few studies on collective SEB as it relates to CC (Busch et al., 2019), and—at least for German-speaking countries—no suitable instruments exist to assess individual and collective SEB regarding CC among school students and (prospective) teachers. In light of the aforementioned considerations, this paper aims to present the development and testing of an item-based questionnaire designed to assess individual and collective SEB on CC. The test-theoretical suitability of the items, as well as the factorial structure, will be presented and discussed. The test results for school students and future geography teachers (university students) will be compared, including the question of to what extent individual and collective SEB can be empirically separated.

2. Theoretical Foundation and State of Research

2.1 Self-Efficacy Beliefs—Definition, Classification, Relevance, and Research Findings

The concept of SEB goes back to Bandura (1977): "An efficacy expectation is the conviction that one

can successfully execute the behavior required to produce the outcomes. […] Efficacy expectations determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences" (pp. 193–194). In

this sense, SEB can be seen as beliefs about one's own competence or *competence beliefs* (SCHWARZER & WARNER, 2014), i.e., the subjective certainty of being able to cope with new or difficult demanding situations on the basis of one's own competence (SCHWARZER & JERUSALEM, 2002, p. 35). In line with this characterization, we refer to SEB throughout this article, even if terms such as *self-efficacy*, *self-efficacy-expectations*, *perceived self-efficacy* and *SEB* are often used synonymously in the literature. This is to emphasize that in this context, it is not a matter of actually experiencing self-efficacy; rather, the focus is on subjective beliefs about the self in terms of one's own self-efficacy.

SEB plays a central role in the theory of planned behavior (AJZEN, 1991). Referred to as "perceived behavioral control" (AJZEN, 1991, p. 183), SEB, together with intention, is said to have a direct effect on people's actions. Empirical evidence for this can be found in literature (AJZEN, 1991). Recent studies based on the theory of planned behavior also confirm the relevance of SEB: "The strong impact [in this study, author's note] of perceived behavioral control on intentions and on behavior is especially noteworthy" (LEEUW ET AL., 2015, p. 135). Although the theory of planned behavior has been modified in parts, differentiated, or combined with other theoretical models, the importance of SEB has been repeatedly confirmed (e.g., BAMBERG ET AL., 2015). For instance, in the context of environmentally conscious behaviors, a meta-analysis (BAMBERG & MÖSER, 2007) revealed that, in general, perceived behavioral control, attitudes, and moral norms serve as independent and approximately equal predictors of intention to act.

SEB can be classified into two categories: general SEB and collective SEB. General SEB is related to life in general, as exemplified, for example, by the established scale of SCHWARZER and JERUSALEM (2003). General SEB can be distinguished from situation-specific SEB, with domain-specific SEB (e.g., the school-related SEB of students) located between the two (SCHWARZER & WARNER, 2014). SEB on CC can be categorized as situation-specific/domain-specific SEB, since it is related to a concrete topic area rather than being on a general level. As the situation described (in the items) becomes more concrete, the degree of situation specificity increases. Regarding the relationship between the generality or specificity of SEB, HANSS and BÖHM (2010) reported in the context of a study on sustainability that there is a weak correlation between general SEB and domain-specific SEB related to sustainability.

Individual SEB can be distinguished from collective SEB (BANDURA, 1997; SCHWARZER & WARNER, 2014). Individual SEB as competence belief is related to the single self, while collective SEB includes the group(s) we belong to or in which we act. "Collective efficacy is especially important when considering collective environmental problems, such as climate change, in which individual actions are not likely to offer solutions unless taken by large numbers of people acting together" (BUSCH ET AL., 2019, p. 2393). BANDURA (1997) defined collective SEB as "a group's shared belief in its conjoint capabilities to organize and execute the courses of action required to produce given levels of attainments" (p. 477). This shows that, on the one hand, collective SEB is not merely the sum of the individual SEB of the group members (BANDURA, 2000) and that, on the other hand, individual and collective SEB are interrelated. Thus, the conviction that joint action with others can address the challenges of CC is an important (motivational) prerequisite for individuals to engage in joint action (BANDURA, 2000).

Experimental studies have shown that an increase in collective SEB also leads to an increase in individual SEB (JUGERT ET AL., 2016). Other studies have suggested that collective SEB may be a stronger predictor of pro-environmental behavior than individual SEB (CHEN, 2015; HOMBURG & STOLBERG, 2006). One study on sustainable tourism (DORAN ET AL., 2015) separately assessed the individual and collective SEB of adult tourists ($n = 358$). Hierarchical regression analyses illustrated that collective SEB was the strongest predictor of willingness to spend money on environmental aspects, but that individual SEB and attitudes also had an influence (DORAN ET AL., 2015). The results of BUSCH ET AL. (2019), who measured individual and collective SEB (USA, $n = 453$) alongside other factors and analyzed them using structural equation modeling, point in a similar direction. SEB and social norms were found to be the strongest predictors of climate-friendly behavior. In addition, it became clear that the highest mean values for SEB were at the level of people as a whole, while individual SEB fell in the middle range of the scale. The authors saw this as an indication of the particular importance of collective SEB, "as climate change is a collective environmental problem requiring collective action" (BUSCH ET AL., 2019, p. 2403).

SEB is not understood as a constant personal characteristic; rather, in principle, SEB can change (BANDURA, 1977). This also applies to school contexts, where SEB can be strengthened through targeted interventions (SCHUNK & PAJARES, 2006). As part of an educational program evaluation ($n = 1.241$), FLORA ET AL. (2014) reported an increase in SEB related to CC in the pre-post comparison with an effect size of $r = 0.42$. In contrast, in an evaluation ($n = 343$) of a science communication event on the climate crisis, no changes in individual and collective SEB were found (KÜHNER &

Goodwin, 2023). In another study, latent path analyses showed that more CC-knowledge does not directly lead to more SEB; however, when CC-concern is included, an indirect path from knowledge to SEB is shown, via concern: more knowledge leads to more concern and more concern leads to higher SEB (Milfont, 2012).

Contexts can also influence SEB, as Gifford and Comeau (2011) showed in an experimental study (n = 1.038). Among other aspects, they captured respondents' perceived competence "to engage in pro-environmental behaviors that could reduce greenhouse gas emissions" (Gifford & Comeau, 2011, p. 1.303). They implemented three different conditions: one group received motivational framing, a second received framing primarily emphasizing the costs of CC countermeasures, and a control group received no framing. The motivational framing group had significantly higher perceived competence than the control group. In contrast, the second group (which was primarily shown the cost of countermeasures) had significantly lower perceived competence than the control group (Gifford & Comeau, 2011). From this, the authors concluded that, in general, "motivational messages clearly are to be preferred over sacrifice messages" (Gifford & Comeau, 2011, p. 1305). For the future, they suggest, among other things, that "effective frames for climate change solutions should enhance perceived competence […]" (Gifford & Comeau, 2011, p. 1306).

2.2 Capturing Self-Efficacy Beliefs

A number of studies assess individual and/or collective SEB and document the survey instruments; a selection of relevant papers including item formulations is compiled in Fig. 1.

Analysis of the methodological approaches these studies take, provides important clues for item development in this project. In general, it can be stated that all studies available to us are item-based with a closed-response format. The vast majority of studies provide the wording of the items, or at least the corresponding content of the items. However, in addition to means and standard deviations–with the exception of Cronbach's alpha as an indication of reliability–almost no study provides differentiated statistical information.

Kellstedt et al. (2008) reported a factor analysis of the three items used without further methodological references (to discrepancy function and rotation technique). The factor analysis resulted in factor loadings of the three items on a common factor of $0.453 < \lambda < 0.659$, which the authors regarded as an indication of the one-dimensionality of the scale. In addition to item formulation, the study by Hanss and Böhm (2010) on sustainable consumption behavior is also worthy of note. They examined the 20 items used (only four of which had references to CC) employing principal components analyses and were able to identify four factors that were meaningful in terms of content and reliable (Cronbach's alpha ≥ .85; Döring & Bortz, 2016). These factors did not relate to areas of content (such as CC, among others), but described different aspects of SEB. Thus, one factor consisted of SEB motivating others to take similar actions through one's own sustainable behavior. In addition, the study by Doran et al. (2015) is of particular relevance, even though it is not related to CC, but to sustainable tourism. In this study, individual and collective SEB were captured and PCA (direct oblimin) was conducted in each case individually. Based on this, the authors inferred a one-dimensional structure in each case and worked with a mean scale for individual and one for collective SEB as a next step (Doran et al., 2015, p. 287). No other available studies contain statements about factorial structure, nor do any studies address the question of the extent to which individual and collective SEB can be distinguished from one another, not only theoretically but also empirically.

With regard to the specific wording of the items, it should first be noted that for some studies, some items are listed as part of an SEB scale but do not represent SEB in the narrower sense with regard to the formulation. In one case, this is even noted by the author himself (Item "whether the respondents accept climate change as a human responsibility"; Milfont, 2012, p. 1.010). Another example is the item "Human beings are responsible for global warming and climate change" (Kellstedt et al., 2008, p. 118). Others refer to more closely related constructs, such as locus of control (Baldwin et al., 2022; Fielding & Head, 2012; Hermans & Korhonen, 2017; Pickering et al., 2020). The central difference is that locus of control is about the belief of whether one's own or joint actions can be effective at all. In contrast, SEB refers to the belief of one's own competence to achieve certain effects (Bandura, 1977). Of particular interest is the SEB scale used by Flora et al. (2014), which consists of two items: "How confident are you that you could help start a project to reduce your school's carbon footprint?" and "How confident are you that you could explain global warming to others?" (Flora et al., 2014, supplemental material). Two different aspects of SEB are addressed: a more action-related component and a more communicative or knowledge-related component. Moreover, items are formulated in a comparatively situation-specific way, which seems particularly suitable for the instrument we are developing as it enhances comprehensibility

for the target group of school students and university students. The three items used by Doran et al. (2015) also refer to respondents' own actions as well as motivating others, thus encompassing two facets of individual SEB. In contrast, the items used by Gifford and Comeau (2011) are on a more domain-specific level and relate primarily to actions in terms of reducing GHG emissions. The same applies to the two items of Kühner and Goodwin (2023); it should also be noted that these items are very similar in language and content (both operate with fighting the climate crisis; Kühner & Goodwin, 2023, p. 24).

Source	iSEB/ coSEB	Topic	Items #	Response Scale	Item Wording	Statistical Parameters
Kellstedt et al. (2008)	iSEB	climate change	3	4-point	(1) "My actions to reduce the effects of global warming and climate change in my community will encourage others to reduce the effects of global warming through their own actions"; (2) "I believe my actions have an influence on global warming and climate change", and (3) "Human beings are responsible for global warming and climate change".	α=.634 n=1.093
Hanss & Böhm (2010)	iSEB	sustainable consumption decisions	20	4-point	(1), (2) and (3) by Kellstedt et al. (2008) and in addition "My everyday consumption and buying behavior has an influence on global warming and climate change". All others without reference to climate change.	[1]n=402
Flora et al. (2014)	iSEB	climate change	2	10-point	(1) "How confident are you that you could help start a project to reduce your school's carbon footprint?" and (2) "How confident are you that you could explain global warming to others?"	α=.68 n=1.241
Milfont (2012)	iSEB	climate change	3	5-point	Perceived ability (1) to influence global warming and climate change outcomes, (2) whether the actions of the respondent will influence others to behave in ways that mitigate the effects of global warming, and (3) whether the respondents accept climate change as a human responsibility.[2]	α=.703 n=269
Kuthe et al. (2019)	iSEB	climate change	1 (5)	6-point	(1) "I am able to contribute to reducing the degree of climate change." All other four items without close reference to SEB.[3]	n=792
Kühner & Goodwin (2023)	iSEB	climate crisis	2	5-point	(1) "I think that I myself can contribute to fighting the climate crisis." and (2) "I know that there are a number of things I can do myself to fight the climate crisis [translated]".	α=.79 n=343
Kühner & Goodwin (2023)	coSEB	climate crisis	2	5-point	(1) "I think that we together can do something against the climate crisis." and (2) "I am optimistic that we together can solve the climate crisis [translated]".	α=.39 n=343
Doran et al. (2015)	iSEB	sustainable tourism	3	7-point	(1) "As a tourist I can help protect the wildlife and natural habitats at my holiday destination," (2) "By choosing environmentally friendly means of travelling, I can help reduce carbon emissions", and (3) "By traveling in an environmentally friendly way, I can encourage others to do the same".	α=.68 n= 358
Doran et al. (2015)	coSEB	sustainable tourism	4	7-point	(1) "I am confident that we as tourists can together contribute to solving the problem of pollution", (2) "We as tourists can come up with creative ideas to help solve environmental problems effectively, even if the external conditions are unfavorable", (3) "I am confident that we as tourists can together help mitigate global climate change", and (4) "I am confident that we as tourists can together encourage more and more people to travel in an environmentally friendly way".	α=.89 n=358
Gifford & Comeau (2011)	iSEB	climate change	6	7-point	(1) "I can improve my ability to cut my greenhouse gas emissions", (2) "I can move faster to stop global warming", (3) "I feel able to meet the challenge of controlling the greenhouse gases that I am responsible for". (4) "I can shrink my contribution to global warming", (5) "I can grow my contribution to environmental solutions", and (6) "I can break through the barriers that prevent me from addressing global warming".	α=.83 n=1.038
Busch et al. (2019)	iSEB coSEB	climate change	5	4-point	How confident are you that you/your family/your friends/your school/people can do something to reduce climate change?	α=.83 n=453

[1] The reliabilities given in the study refer to factors formed by exploratory factor analysis; however, among these factors, none could be described as SEB on CC. Rather, the few items that refer to CC are distributed among different factors. Therefore, no reliability index is given here.

[2] The exact wording is not given.

[3] In the study, reliability is reported for the scale with five items. Since only one of the items refers to SEB in the narrower sense, no reliability index is given here.

Fig. 1. Overview of selected studies on individual (iSEB) and collective self-efficacy (coSEB) (Source: authors)

For collective SEB, the two items used by KÜHNER and GOODWIN (2023) do not show sufficient reliability, which could be due to the differentiation between action and solutions (p. 24), which could have led to strongly differing assessments. Although the work of DORAN ET AL. (2015) examined a different content area (sustainable tourism), it is nevertheless of interest due to the way the items are formulated. The phrase "[…] we as tourists can together […]" is employed with remarkable consistency (DORAN ET AL., 2015, p. 286). At the same time, however, with common actions and the motivation of others, different facets of collective SEB are included, thus increasing the range of content.

BUSCH ET AL. (2019) took a significantly different approach to item construction by asking the respondents to assess how certain they are that something can be done to reduce CC for themselves, their families, their friends, their schools, and people in general. The formulation of the item set is thus identical and only the reference group varies; at the same time, reliability is calculated across all items and a separation between individual and collective SEB is only possible to a limited extent, since individual SEB is only assessed by one item. Nevertheless, the approach of including different reference groups (family, friends, etc.) in collective SEB should be emphasized and can be seen as a differentiation of the formulation "we […] together" (DORAN ET AL., 2015, p. 286).

In summary, concerning the development of items for individual and collective SEB on CC, it can be asserted that no instrument appears entirely suitable to serve as a template (e.g., through sole translation into German), but that very helpful insights can be derived from the studies cited. What appears essential in this context is the breadth of content, encompassing actions, communication or knowledge-related elements, the motivation of others, and the inclusion of different reference groups in collective SEB. With regard to the scale-related analysis, it is imperative to empirically test the distinction between individual and collective SEB, a differentiation not yet addressed in the existing studies.

3. Goals and Research Questions

In this project, we developed an instrument to capture individual and collective SEB on CC, which we call *SEB-CC*. While the instruments identified in the existing literature provide a valuable starting point, to our knowledge, there is no comprehensive and fully documented instrument available to date. Providing such an instrument is crucial because it can form the basis for more advanced research projects and enable the analysis of the characteristics of SEB-CC as well as comparisons between different groups. It can also be used to examine the effectiveness of teaching in schools as well as university events or in-service training for teachers. In addition, the completion of the questionnaire can also provide an opportunity for self-reflection, for example, to reflect on one's SEB-CC in learning situations, such as geography classes or university seminars in the field of geographic education. Becoming aware of one's SEB can be an exciting starting point for discussions, allowing for comparisons with the characteristics of other school students or university students.

In light of the aforementioned background and the current state of research, a number of criteria and objectives can be formulated for the development of the instrument. (1) The instrument to be developed should be practical to use, including in a geography classroom. Therefore, it must be time-efficient to apply. It should also be able to be used and evaluated quickly, even in situations where time is limited. This implies—analogous to the studies available to us—the use of a closed, item-based answer format. (2) In addition, SEB-CC should be suitable for the relevant actors in geography classrooms: school students and teachers. This facilitates comparisons between the two groups, a promising approach in light of the values of characteristics. For this project, this means considering both groups in the questionnaire development. However, for pragmatic reasons, namely the difficulty in accessing a larger number of teachers, we elected to work with future teachers, i.e., students in the geography teaching program, instead of surveying in-service teachers. (3) Furthermore, ideally, it should be possible to distinguish between individual and collective SEB with regard to CC. Some studies on SEB-CC report separate scale reliabilities for individual and collective SEB. However, no study provides evidence on the extent to which the factorial structure actually supports separate consideration of individual and collective SEB. Moreover, the question arises of whether this separation is also evident in different groups. Therefore, in the context of this study, it is essential to not only evaluate reliabilities but also address the question of the latent structures of the questionnaire.

The overall goal of developing a questionnaire to assess SEB-CC can therefore be solidified with the following research questions:

(1) To what extent are the (partly newly developed) items suitable for assessing SEB-CC?

(2) What latent structure underlies the items and does this latent structure follow the distinction between individual and collective SEB?

(3) Is the instrument equally suitable for different groups (university students of geography as future teachers as well as school students)?

4. Methodological Approach

The methodological approach comprised several successive steps (see Fig. 2). Essentially, the literature-based item development was followed by expert rounds and qualitative pretesting. The items were then used in parallel in two test groups (school students and university students). In both data sets, the item characteristics were analyzed, and the factorial structure was explored with the help of exploratory factor analyses (EFA).
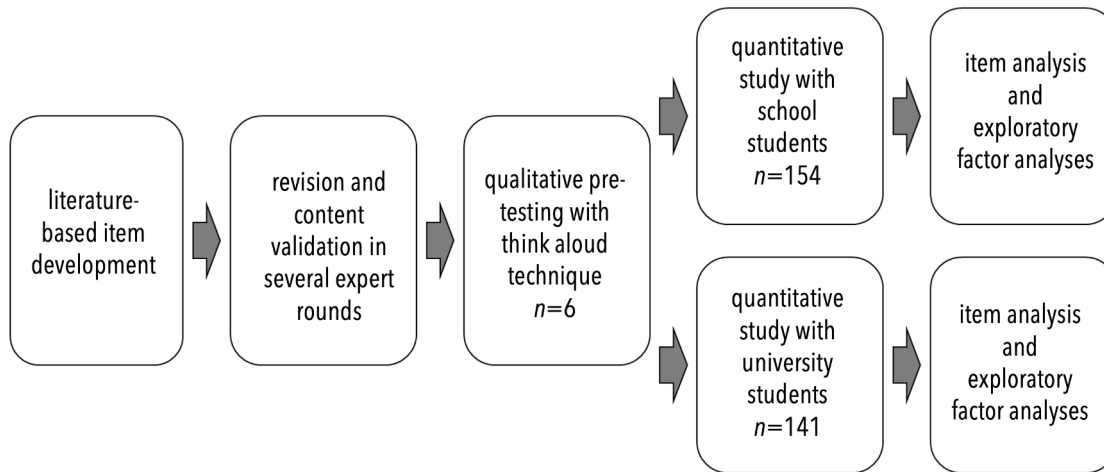

Fig. 2. Overview of the methodological approach (Source: authors)

4.1 Development of the Items

Based on the state of research and with a view to an instrument usable in a time-efficient manner, a limited number of items were formulated, some of which were translated (into German) or adapted from other studies, while others were newly developed. A total of 12 items were created, eight of which were assigned to individual SEB (iSEB) and four to collective SEB (coSEB) (see Appendix 1). The English translations provided are for communicative understanding only; the items used in the studies were all formulated in German. For individual SEB, two items were formulated regarding the individual's actions (iSEB4 and iSEB5, based on Kellstedt et al., 2008; Kühner & Goodwin, 2023; Milfont, 2012). In two additional items, the aspect of motivating others to act in a climate-friendly way was addressed (iSEB7 and iSEB8, following Doran et al., 2015; Kellstedt et al., 2008; Milfont, 2012). The communicative or knowledge-related component used by Flora et al. (2014) was addressed for the development of two items (iSEB2 and iSEB6), while the wording is based on items from the "topic-specific self-efficacy" scale by Kauertz et al. (2014, pp. 121–122). Since statements denying or questioning CC or the anthropogenic causes of CC are disseminated in (social) media, the appropriate handling of information, including sound judgment, plays an important role. Against this background, two items (iSEB1 and iSEB3) were newly developed to address SEB in dealing with information on CC, including on social media.

For collective SEB, different groups on different scale levels (family, region, the federal state of Bavaria, and Germany) were taken into account, following Busch et al. (2019). The levels of Europe and the world, which are essential for CC-related action, were deliberately omitted in favor of groups that are still imaginable for students and realistic as groups that act. These groups were linked to climate-friendly actions (coSEB3 and coSEB4) and the motivation of others (coSEB1 and coSEB2). The aspects of dealing with fake news and knowledge/communication that were considered in the individual SEB were not addressed in the collective SEB, as here the reference to the individual is very strong and the collective level is less relevant.

The items were preceded by a brief instruction (*How do you think about yourself? Please tick to what extent the following statements apply to you*). A six-point Likert-type scale was used as the re-

sponse scale, with numbers ranging from 1 (indicating strong disagreement) to 6 (indicating strong agreement). First, the eight items on individual SEB were placed in random order, followed by the items on collective SEB, which were also placed in random order.

4.2 Expert Rounds and Qualitative Pretesting

The items developed were first discussed, then adapted and discussed again by the researchers in several rounds. This resulted, among other things, in the addition of statements on the handling of CC information on social media. Particular attention was given to content validity, leading to the presentation and discussion of the items in a research colloquium with a multi-professional composition, including researchers from different subject didactics and the field of ESD as well as in-service teachers. The inclusion of items referencing social media was supported as a crucial content aspect. It was also confirmed that overall, the items included all important and relevant aspects of SEB on CC. This can be seen as an indication of the content validity of the developed instrument. For the version that emerged from these rounds, the next step was qualitative pretesting ($n = 6$) of school students (9th and 10th grade) and university students. The item formulation was tested using the thinking aloud and inquiry techniques (Weichbold, 2014, p. 301); however, only minimal adjustments were made to the items, indicating an adequate understanding of the formulations.

4.3 Data Collection and Sample Description

The first page of the questionnaire contained brief references to the topic (CC) and the objectives of the study. The participants were informed that their engagement in the study was voluntary. In addition, they were assured that no disadvantages would result from non-participation and that (except for gender, school grade, or semester at university) no personal data would be collected. The anonymity of all data was assured and information about data processing and data storage was provided. Participants gave written consent, with minors obtaining written parental consent. As this was a survey study, no ethics committee approval was required. However, the data protection commissioner examined and approved the study including an approval for data collection at schools (Bavarian State Ministry of Education). In both samples, the data collection was conducted simultaneously in the summer and autumn of 2022. A total of 145 students (98 females, 43 males) at a German university participated in the survey as part of a geography education

course (Dataset: Schubert & Velling, 2023). Of the students, 57% were in their third or fourth semester and 28% were in their fifth or sixth semester. Just under half were studying to be primary school teachers, slightly more than one-third were studying to be grammar school (*Gymnasium*) teachers, and the remainder were studying to be secondary school teachers (*Realschule* and *Mittelschule*). After removing the respondents with missing values in the 12 items on SEB, 141 datasets remained. In the study with students at the low end of secondary school (*school students* hereafter), a total of 163 individuals (84 female, 74 male) participated, of whom 74% were in grade 9 and around 26% in grade 10 of secondary school (*Gymnasium*) (Dataset: Hofmann et al., 2023). After excluding the test individuals with missing values in the SEB items, a data set of $n = 154$ remained.

4.4 Data Analysis

First, an item analysis was carried out in SPSS 29 (IBM Corp., 2022) separately for both data sets (school students and university students) for mean values (*M*), standard deviation (*SD*), and item difficulty (P_i) as well as the item–test correlation (r_{it}). In addition, the reliability was tested using Cronbach's alpha, including if the respective item was removed from the scale ($α_{if del}$). The datasets were then imported into R-Studio (RStudio Team, 2023) using the package *foreign* (R Core Team, 2022), followed by EFA in R-Studio using the packages *psych* (Revelle, 2023) and *GPArotation* (Bernaards & Jennrich, 2005). This procedure aligned closely with the specifications in Bühner (2021). Alternatively, it would have been possible to use confirmatory factor analyses (CFA) and corresponding model fits to contrast a one-dimensional solution with a two-dimensional solution which differentiates between individual and collective SEB. However, since the items are translated, adapted, and in part newly developed, and since the latent structure may also deviate from the theoretically expected one- or two-dimensional solutions, the decision was made to first work with EFAs. This approach follows the recommendations of Brown (2015), who suggests the use of EFA as the first step in newly developed questionnaires, with CFA then used in a new data set as the next step. The data of both samples were tested for suitability for EFA by determining the measure-of-sample adequacy coefficients (MSA) and Kaiser-Meyer-Olkin (KMO) coefficients. The minimum values of KMO = 0.5 and MSA > 0.5 apply here (Bühner, 2021, p. 420). In addition, the minimum requirement for EFA, the presence of correlations of the correlation matrix, was tested using Bartlett's test

(Bühner, 2021, p. 419). Critically, it must be mentioned that the sample sizes of $n = 141$ and $n = 154$ are significantly below the recommendation of Schönbrodt and Perugini (2013) of $n = 250$.

In the next step, the number of factors was determined based on several characteristic values. Following Bühner (2021, p. 409), the Kaiser criterion *eigenvalue > 1*, which was widely used in the past, and the *scree test* were not used, but instead, a parallel analysis was carried out in R-Studio and the Empirical Kaiser Criterion (EKC) was determined. In addition, the MAP test and the Bayesian Information Criterion (BIC) were used.

Based on these results, EFAs were conducted separately for the university student data set and the school student data set under the conditions of the previously obtained number of factors. With regard to the different rotation techniques available, an oblique rotation technique (direct-oblimin) was chosen because it is assumed that SEB factors are correlated with each other (Bühner, 2021, p. 422). The maximum likelihood (ML) discrepancy function with Pearson correlations was therefore chosen as the discrepancy function in accordance with the recommendations of Bühner (2021, p. 422).

The significance of the factor loadings (λ) was tested using the bootstrap method (20 iterations), and double loadings were critically analyzed. In cases where item analyses, factor loadings, etc. suggest the removal of individual items, Brown (2015) recommended carrying out all steps of the EFA again with the reduced set of items. For factor loadings, according to Comrey and Lee (1992, p. 243), values from $λ = .55$ are considered good, from $λ = .63$ very good, and from $λ = .71$ excellent. Therefore, a cut-off value of $λ = .55$ was used. The reliability of the factors was tested using Cronbach's alpha following the strict specifications of Döring and Bortz (2016), where reliability is considered high at $α > .90$ and sufficient at $α > .80$.

The results of the item analyses and the individual steps and results of the EFAs are presented below, first for the university student sample and then for the sample of the school students.

5. Presentation of the Results

5.1 SEB on CC Among University Students

The items did not show any abnormalities (see Appendix 1), and the item difficulties were all in the higher range but below the commonly used limit of $P_i = 0.8$. The item-scale correlation for all items was higher than $r_{it} ≥ .46$, which is above the lower limits of .30 and .40 found in the literature. If all 12 items were considered as an overall scale, the scale would reach a sufficient reliability (Döring & Bortz, 2016, p. 443) of $α = .86$, which would not increase through the removal of individual items ($α_{if\ del}$).

The test for the suitability of the data for EFAs showed a KMO coefficient of 0.85. In addition, the MSA coefficients for the individual items were > 0.81 and thus far above the minimum value. Bartlett's test ($χ^2(66) = 573.61$, $p < .001$) indicated correlations of the correlation matrix. The parallel analysis and the EKC both suggested the extraction of three factors; the MAP test suggested two factors, with values for two (MAP = 0.044) and three (MAP = 0.0045) factors very close to one another; the comparison of the BIC for different factor models delivered arguments for a three-factor model. Overall, the characteristic values clearly indicated a three-factorial model. An EFA with the specification of three factors resulted in the factor's eigenvalues of 2.38 (ML1), 2.25 (ML2) and 2.05 (ML3); the differences in the factor values of the three factors explained 56% of the differences in the item responses of the items in the factor analysis.

The level of the main loadings was very good to excellent ($0.66 < λ < .83$) for all items except coSEB2 ($λ = .49$) and iSe5 ($λ = .46$) (Comrey & Lee, 1992). The significance of the factor loadings was tested using the bootstrap method (20 iterations), while using an adjusted value of $p = 0.00139$ (calculated by dividing 0.05 by the product of 12 items and 3 factors) for the confidence intervals for errors of the first type. This showed that all main loadings, with the exception of the items coSEB2 and iSEB5, were significant, and all secondary loadings were not significant.

Only the items coSEB2 (on ML1: .49 and on ML3: .20) and iSEB5 (on ML1: .46 and on ML3: .30) had double loadings. While they were understandable in terms of content, at the same time, this would argue against a simple structure of the factors, making the calculation of factor mean values and subsequent analyses more difficult. The question arose of whether to remove the items or to retain them and assign them to a factor from a content perspective despite the double loadings. The breadth of contents of the three factors (see below) would also be given without the two items–the number of items per factor would be in the range of the lower limit without the two items (with three items each still available) but would still be sufficient. In addition, the loadings of the two items were also not significant. Therefore, the decision was made to remove the items, especially given the goal of using the factors for further analyses (also in the form of factor means). In the next step, another EFA was carried out for the remaining 10 items.

For the reduced set of 10 items, the conditions for EFA were also favorable, as shown by Bartlett's test ($\chi^2(45) = 486.56$, $p < .001$) as well as the KMO coefficient (0.82) and the MSA coefficients ($\geq .77$). Only the limitations regarding the sample size remained.

Regarding the number of factors, the parallel analysis suggested four factors while the EKC and the BIC suggested three factors. The MAP test suggested two factors, while the values for the two-factorial (MAP = 0.061) and the three-factorial (MAP = 0.066) model were close together. Therefore, analogous to the first EFA, three factors were extracted (maximum likelihood with oblimin rotation), which had eigenvalues of 1.83 (ML1), 2.29 (ML2) and 1.84 (ML3), respectively, with 60% variance explained.

The three factors can be interpreted meaningfully in terms of content. Factor ML2 (see Fig. 3) comprises individual SEB at the cognitive level: difficult questions can be answered and CC can be explained to others; furthermore, fake news on CC can be recognized as such. The common factor is the SEB of being able to deal appropriately with facts about CC on a cognitive level. A possible wording for this factor is *individual SEB with regard to CC knowledge*. Factor ML1 is also classified in the area of individual SEB, but the items include the action

level: I can behave appropriately with regard to CC in everyday life and I succeed in motivating others for climate-friendly behavior or convincing others to take action for climate protection. One possible wording for the factor is *individual SEB with regard to climate action*. The third factor, ML3, comprises collective SEB on different scales or reference levels. It is always about collective action with regard to CC: jointly convincing others of the importance of climate protection measures, jointly carrying out actions for climate protection and jointly making everyday actions more climate-friendly. The social and spatial references include the individual's own region, Bavaria, and Germany. A possible wording for the factor is *collective SEB on CC*.

The factor loadings (see Fig. 3) are at least in the very good range ($0.66 \leq \lambda \leq 0.89$; Comrey & Lee, 1992), significant (bootstrap method, $p = .00167$, 20 iterations) and without substantial side loadings (all side loadings were non-significant). Therefore, a single structure (Bühner, 2021, p. 410) is given. The factors correlate with $0.27 < r < 0.52$ — below the cut-off values of $r < .80$ and $r < .85$ respectively (Brown, 2015, p. 116; Bühner, 2021, p. 432) — which argues for the independent interpretability of the factors. Here, individual SEB action correlates at

		ML2	ML3	ML1
		ind. SEB knowledge	coll. SEB	ind. SEB action
	α	.838	.819	.806
	M	4.37	4.08	4.18
	SD	0.97	1.05	1.03
iSEB2	I trust myself to answer difficult questions about climate change.	.81	.03	-.09
iSEB1	I can recognize when false information about climate change is being spread on social media.	.76	-.02	.05
iSEB3	I trust myself to distinguish scientific information from untrustworthy information about climate change.	.71	-.07	.11
iSEB6	I can explain climate change to others.	.66	.13	.00
coSEB1	We together in Germany can convince others of the importance of climate protection measures.	.04	.80	-.03
coSEB4	We together in Bavaria can change our everyday behavior to mitigate climate change.	.01	.76	.04
coSEB3	We in our region can plan and implement climate protection actions together.	-.02	.72	.08
iSEB8	I trust myself to motivate others to adopt climate-friendly behavior.	-.04	.06	.89
iSEB7	I can convince others that it is important to take a stand for climate protection measures.	.15	-.13	.68
iSEB4	I have the confidence to behave in a climate-friendly way in my everyday life.	.00	.09	.67

Fig. 3. Sample matrix of the EFA with 10 items (without iSEB5 and coSEB2), university students (Source: authors)

		ML1	ML2
		SEB action	**ind. SEB-knowledge**
α		.923	.780
M		4.28	4.02
SD		1.08	1.15
coSEB4	We together in Bavaria can change our everyday behavior to mitigate climate change.	.86	-.04
iSEB8	I trust myself to motivate others to adopt climate-friendly behavior.	.83	.04
coSEB2	We together as a family can convince others to behave in a climate-friendly way.	.80	.00
iSEB4	I have the confidence to behave in a climate-friendly way in my everyday life.	.79	-.10
iSEB7	I can convince others that it is important to take a stand for climate protection measures.	.77	.05
coSEB1	We together in Germany can convince others of the importance of climate protection measures.	.76	.06
coSEB3	We in our region can plan and implement climate protection actions together.	.70	.09
iSEB5	I can help mitigate climate change through my actions.	.67	-.03
iSEB1	I can recognize when false information about climate change is being spread on social media.	-.05	.81
iSEB3	I trust myself to distinguish scientific information from untrustworthy information about climate change.	.04	.81
iSEB2	I trust myself to answer difficult questions about climate change.	.10	.55

Fig. 4. Sample matrix of the EFA with 11 items (without iSEB6), school students (Source: authors)

$r = 0.52$ with individual SEB knowledge and at the same level with collective SEB, whereas individual SEB knowledge correlates only at $r = 0.27$ with collective SEB. In terms of content, this is understandable: The two individual SEB scales correlate more strongly, whereas the individual SEB knowledge has a significantly weaker correlation with the collective, more action-related SEB. The reliabilities of the three factors were subsequently tested. These were in the sufficient range with Cronbach's alpha ≥.806 (Döring & Bortz, 2016).

5.2 SEB on CC Among School Students

The item scores did not show any abnormalities (see Appendix 2), and the overall scale reached high reliability (Döring & Bortz, 2016, p. 443) of α=.92. The mean values for most items were slightly lower than for the group of university students.

The data was suitable for EFA (Bartlett's test: $\chi^2(66) = 1113.136$, $p < .001$; KMO = 0.89; MSA ≥ 0.79). With regard to the number of factors, the parallel test, the MAP test, the BIC, and the EKC suggested the extraction of two factors, so an EFA (direct-oblimin, maximum likelihood discrepancy function) with two factors was calculated. The eigenvalues of the factors were 4.98 (ML1) and 1.94 (ML2); the variance resolution was 58%, and the factors correlated with $r = .58$. The main loadings of the items were significant and, with the exception of iSEB6 ($\lambda = .41$), the values were at least in the good range ($.60 \leq \lambda \leq .86$). The secondary loadings were not significant, with the exception of iSEB6 ($\lambda = .26$). Given that the double loading included significant side loadings, iSEB6 was excluded, and the analyses were repeated for the remaining 11 items. The suitability of the data for EFA was still given (Bartlett's test: $\chi^2(55) = 732.735$, $p < .001$; KMO = 0.90; MSA ≥ 0.78): With regard to the number of factors, all tests suggested the extraction of two factors.

The EFA resulted in good to excellent (Comrey & Lee, 1992) main loadings ($0.55 \leq \lambda \leq 0.86$) without noteworthy secondary loadings (see Fig. 4). The factors had a high or still sufficient reliability of ≥.78 and can be interpreted meaningfully in terms of content. A possible wording with regard to the

similarities in the content of the items included could be *individual SEB with regard to CC knowledge* (ML2), analogous to the university student

sample, on the one hand, and *SEB with regard to CC action* (ML1), on the other.

6. Discussion, Limitations and Outlook

The goal of this study was to develop and test a questionnaire (SEB-CC) for the assessment of individual and collective SEB on CC. For this purpose, the developed items were used in two groups (university students and school students), the item characteristics were analyzed, and the factorial structure was examined using EFA. As a result, reliable and valid questionnaires with a clear factor structure are available in German-speaking countries for the first time.

In the data set of university students, a three-factor structure proved to be the statistically best solution; at the same time, the factors could be interpreted meaningfully in terms of content. On the level of the latent structures, the collective SEB on CC as well as two facets of the individual SEB were represented with action-related and knowledge-related aspects. For the group of school students, a two-factor solution proved to be statistically optimum and also interpretable in terms of content. Analogous to the latent structures of the university student sample, the individual knowledge-related SEB also emerged as one factor in the school student sample. In contrast, the second factor was a common factor of the individual action-related and the collective SEB, which were separate in the university student data set; the distinction between individual and collective SEB was therefore not successful in the school student dataset. Possible reasons may lie in suboptimal item formulation and selection. At the same time, reference should be made to the limited sample size, which could also be a reason for the different solutions in the two groups. However, since the separation of both areas succeeded in the university student group with the same items, the reason could also be connected to the respondents: The action-related individual SEB and the collective SEB as a common feature have the emphasis on actions—the differences are located in the second content component, which refers either to the individual person or the individual person as part of a community. While the interviewed university students perceived this difference, the mutual action was probably stronger for school students. Age, different private or family situations, and phase of life may have played a role in this. A central difference between the school years at the lower end of secondary school (the school student sample) and university students predominantly in the first third

of their studies (the university student sample) is the process of detachment from family and increasing independence which for many is also demonstrated by having their first apartment at the beginning of their studies. It is at least plausible that these experiences are also accompanied by a stronger perception of different social reference groups, while school students do not make this differentiation to such a strong degree and thus the commonality of the items regarding actions outweighs the differences on the individual and collective level.

Regarding the goals of the study, it can be stated that the goals were achieved for the university student sample but that the developed instrument cannot differentiate between individual and collective SEB in the school student sample. Concurrently, the item set allows for a separate assessment of knowledge-related and action-related SEB on CC in both groups. This differentiation can be beneficial, especially with regard to the evaluation of learning arrangements in geographic education in both classroom and extracurricular settings.

Regarding further limitations, in addition to the general advantages and disadvantages of quantitative approaches, the small sample size for EFA must be particularly mentioned. On a meta-level, the study exemplifies the challenges in developing suitable measurement instruments, particularly the necessity of not assuming one-dimensionality and forming a scale mean solely based on sufficient or good reliability in the form of the Cronbach's alpha of an item set. The example in this study underscored the importance of analyzing the factorial structure—whether it pertains to scales that have been infrequently established by using EFA, or scales that have been used more frequently using CFA. Furthermore, caution is warranted when using an instrument with a different sample without re-examining the factorial structure, as illustrated in this case with the two groups of university students and school students.

On a more content-related level, it should be noted as a limitation that although the items of the collective SEB refer to different scale levels, the scale levels of Europe and World were omitted for the reasons explained above. This must be considered when interpreting the results.

In terms of utilizing the questionnaire to evaluate school and university learning situations, as well as corresponding studies, on the basis of this study, the use the above-described item set with 10 (univer-

sity students) or 11 items (school students), depending on the group surveyed, can be recommended. At the same time, caution is required: although there are plausible content-related explanations for the different factor structures, uncertainty remains, especially concerning the sample sizes. Therefore, in subsequent studies with larger samples, all 12 items should be used. This is due to the suitability and usability of all items in terms of their characteristics. Consequently, this approach allows for differentiated comparisons at the individual item level. However, the calculation of factor means should be carried out with appropriate caution and should consider the factorial structure.

For subsequent stages in the research process of this project, we plan to employ the questionnaire again in larger samples, verifying the factorial structure with the help of CFA based on the findings of this study. This next step would complete the two phases of Brown's (2015) questionnaire development—first exploring the latent structures using EFA, then in the next step testing the factorial structure with a new sample using CFA. In this context, the characteristics of the SEB of school students and university students as future geography teachers are described, and group differences are analyzed using inferential statistical methods. In addition, further connections between SEB and other constructs, such as knowledge, will be investigated and their relevance for climate-related willingness to act will be examined.

Data Availability Statement

The data supporting the findings of this study are openly available (as raw datasets).

(1) Hofmann, A., Schubert, J. C., & Höhnle, S. (2023). *Individual and Collective School-Students' Self-Efficacy on Climate Change* [Raw data set]. Zenodo.

(2) Schubert, J. C., & Velling, H. (2023). *Individual and Collective University Students' Self-Efficacy on Climate Change* [Raw data set]. Zenodo.

Disclosure Statement

The authors report no competing interests.

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		N	*M*	*SD*	*P*$_i$	*r*$_{it}$	α $_{if del.}$
iSEB1	I can recognize when false information about climate change is being spread on social media. [*Ich schaffe es zu erkennen, wenn in sozialen Medien falsche Informationen zum Klimawandel verbreitet werden.*]	141	4.64	1.15	0.73	0.55	0.85
iSEB2	I trust myself to answer difficult questions about climate change. [*Ich traue mir zu, schwierige Fragen zum Klimawandel zu beantworten.*]	141	3.68	1.23	0.54	0.48	0.86
iSEB3	I trust myself to distinguish scientific information from untrustworthy information about climate change. [*Ich traue mir zu, wissenschaftliche Informationen zum Klimawandel von unseriösen zu unterscheiden.*]	141	4.69	1.17	0.74	0.52	0.86
iSEB4	I have the confidence to behave in a climate-friendly way in my everyday life. [*Ich traue es mir zu, mich in meinem Alltag klimafreundlich zu verhalten.]*	141	4.47	1.14	0.69	0.62	0.85
iSEB5	I can help mitigate climate change through my actions. [*Ich kann durch mein Handeln helfen, den Klimawandel abzumildern.*]	141	4.26	1.31	0.65	0.53	0.86
iSEB6	I can explain climate change to others. *[Ich schaffe es, anderen den Klimawandel zu erklären.]*	141	4.48	1.18	0.70	0.51	0.86
iSEB7	I can convince others that it is important to take a stand for climate protection measures. [*Ich kann andere davon überzeugen, dass es wichtig ist, sich für Maßnahmen zum Klimaschutz einzusetzen.*]	141	3.87	1.33	0.57	0.56	0.85
iSEB8	I trust myself to motivate others to adopt climate-friendly behavior. [*Ich traue es mir zu, andere zu einem klimafreundlichen Verhalten zu motivieren.*]	141	4.20	1.18	0.64	0.72	0.84
coSEB1	We together in Germany can convince others of the importance of climate protection measures. [*Gemeinsam in Deutschland können wir andere von der Wichtigkeit von Klimaschutzmaßnahmen überzeugen.*]	141	4.13	1.26	0.63	0.53	0.86
coSEB2	We together as a family can convince others to behave in a climate-friendly way. [*Gemeinsam können wir in der Familie andere davon überzeugen, sich klimafreundlich zu verhalten.*]	141	3.95	1.16	0.59	0.46	0.86
coSEB3	We in our region can plan and implement climate protection actions together. [*Wir in der Region können zusammen Aktionen zum Klimaschutz planen und durchführen.]*	141	3.88	1.17	0.58	0.53	0.86
coSEB4	We together in Bavaria can change our everyday behavior to mitigate climate change. [*Wir zusammen in Bayern können unser alltägliches Verhalten verändern, um den Klimawandel abzuschwächen.*]	141	4.21	1.25	0.64	0.55	0.85

Items in English translation for communicative understanding only and original German wording *(italics)*

		N	M	SD	P_i	r_{it}	$\alpha_{if\,del.}$
iSEB1	I can recognize when false information about climate change is being spread on social media.	154	4.25	1.40	0.65	0.51	0.91
iSEB2	I trust myself to answer difficult questions about climate change.	154	3.64	1.32	0.53	0.51	0.91
iSEB3	I trust myself to distinguish scientific information from untrustworthy information about climate change.	154	4.16	1.42	0.63	0.60	0.91
iSEB4	I have the confidence to behave in a climate-friendly way in my everyday life.	154	4.32	1.30	0.66	0.65	0.91
iSEB5	I can help mitigate climate change through my actions.	154	4.48	1.37	0.70	0.60	0.91
iSEB6	I can explain climate change to others.	154	4.20	1.37	0.64	0.56	0.91
iSEB7	I can convince others that it is important to take a stand for climate protection measures.	154	3.90	1.33	0.58	0.74	0.90
iSEB8	I trust myself to motivate others to adopt climate-friendly behavior.	154	4.05	1.38	0.61	0.79	0.90
coSEB1	We together in Germany can convince others of the importance of climate protection measures.	154	4.51	1.26	0.70	0.75	0.90
coSEB2	We together as a family can convince others to behave in a climate-friendly way.	154	4.14	1.38	0.63	0.73	0.90
coSEB3	We in our region can plan and implement climate protection actions together.	154	4.23	1.40	0.65	0.71	0.91
coSEB4	We together in Bavaria can change our everyday behavior to mitigate climate change.	154	4.60	1.24	0.72	0.75	0.90