Development and validation of an instrument for measuring action competence in sustainable development within early adolescents : the action competence in sustainable development questionnaire (ACiSD-Q)

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## Abstract

Action competence consists of the knowledge, willingness, and self-efficacy for contributing to a controversial issue such as sustainable development. As such, action competence in sustainable development (ACiSD) is a desired outcome of education for sustainable development (ESD). Still, the scarce instruments for measuring ACiSD that have been developed to date, are not specifically designed for early adolescence, when civic involvement is developed. Therefore, this study reports on the development of such a measurement instrument: the Action Competence in Sustainable Development Questionnaire (ACiSD-Q). A mixed-method approach in four steps used three different samples: after a literature review (step 1), early adolescents ($n = 75$) informed the generation of an initial item pool (step 2; qualitative). After assessment of the scale's content validity it was administered to a second sample ($n = 403$) to test psychometric properties (step 3; quantitative). Finally, rigorous statistical analyses (third sample, $n = 1796$) confirmed the proposed structure, reliability, construct, and predictive validity of the final ACiSD-Q (step 4; quantitative). Our findings support a valid and reliable third-order model, fit for monitoring ESD efforts that aim to enhance early adolescents' action competence in sustainable development.

## Acknowledgements

## 1. Introduction

More than ten years ago, Chawla (2009) already pointed at the need for *action* in times when the natural world is at risk. This need for environmental citizenship is still paramount today (Hadjichambis & Reis). Consequently, it does not suffice for education merely to transmit knowledge, skills, and attitudes for learners to reproduce (Eames, Cowie, & Bolstad, 2008). One of the main purposes of education thus becomes to empower learners to take action (Chawla, 2009; Eames et al., 2008) as citizens who are knowledgeable about environmental and citizenship issues and willing to engage in action for sustainable development (Smederevac-Lalic et al., 2020). *Education for sustainable development (ESD)* seeks to help learners to develop the necessary competences in order to make their own decisions, rather than to uncritically reproduce the existing social order (Audigier, 2000; Jickling & Wals, 2008). A desired outcome of ESD is *action competence* (AC; Breiting & Mogensen, 1999), which can be defined as the relevant *knowledge*, *willingness*, and *self-efficacy* for contributing to solving controversial problems (Jensen, 2000; Mogensen & Schnack, 2010; Sass et al., 2020a). The United Nations (2015) proposed 17 *sustainable development* goals (SDGs) aimed at working toward sustainable development (SD), which they defined as a process of mutually interacting environmental, social, and socio-economic perspectives. Thus, sustainability issues qualify as the kind of controversial problem that action seeks to solve. Therefore, a focus of ESD is to help learners develop *action competence in sustainable development (ACiSD)*.

Consequently, ESD and change programs need a *measurement instrument* to monitor learning outcomes, i.e. ACiSD (Sass et al., 2020a). Operationalizing a wickedly complex concept such as ACiSD is a challenging task (Berglund, Gericke, & Rundgren, 2014). Instruments measuring motivation for pro-environmental behavior have been developed (e.g. the Motivation Toward the Environment Scale or MTES by Pelletier, Tuson, Green-Demers, Noels, & Beaton, 1998; the Multiple Motives toward Environmental Protection or MEPS by Gkargkavouzi, Halkos, & Matsiori, 2019), and with the development of measurement instruments such as the Sustainability Consciousness Questionnaire (SCQ-Q; Gericke, Boeve-de Pauw, Berglund, & Olsson, 2019) and the Self-perceived Action Competence for Sustainability Questionnaire (SPACS-Q; Olsson, Gericke, Sass, & Boeve-de Pauw, 2020) also the broader holistic concept of SD has been the focus of measurement development. Still, these instruments focus on a population of adults and adolescents, leaving under twelve-year-olds out of the spotlights. However, it is at the *age of ten to fourteen*, i.e. early adolescence, that individuals develop civic involvement, while social reference shifts from parents to peers (Smetana, Campione-Barr, & Metzger, 2006). This makes this age group especially interesting. Moreover, the SPACS-Q, which was developed in Sweden for the 12-19 age group, was designed with the aim to measure AC generically. This presupposes that the respondents share a common understanding of the complex concept of SD.

Therefore, the *objective of the current study* is to report on the development and validation of the ACiSD-Q, an instrument for measuring ACiSD within ten to fourteen-year-olds who are not necessarily acquainted with the concept of SD and may not be capable of the more complex actions an older population might propose. It can help measuring the learning outcomes of educational approaches such as education for sustainable development in this age category. Thus, teachers can use this instrument to monitor their teaching and decide on future focus points. In other words, measurement results can help teachers decide whether more

attention should be paid to knowledge of possible actions, willingness, confidence in one's own capacities, or confidence in the impact of actions for SD. The focus of this study is to make ACiSD and its subconstructs measurable within a population of early adolescents by complementing existing measurement instruments developed from an adult perspective with one that was developed in collaboration with the target population.

We will first outline the structure of the concept of action competence in sustainable development in the Theoretical Background section. Second, we will depict how the questionnaire was developed and validated in the Analytical Procedures section, reporting on samples, procedures and results of three separate studies. Finally, implications and limitations of the ACiSD-Q, as well as suggestions for further research, will be discussed, before outlining the overall conclusion of this study. Thus, we will offer change programs that aim to develop ACiSD within early adolescents, an instrument that can be used to monitor outcomes of their efforts.

Our research proceeded along four steps (also see the *Analytical Procedures* section) as recommended by Furr (2011). In the *Theoretical Background* section of the current article we will outline the construct of ACiSD (step one). Following the *Analytical Procedures* section, we will devote section four to our *Generation of an initial item pool* (step two). On a third step will be reported in section five, *Piloting the initial measurement instrument*. Section six, *Final instrument evaluation: construct and predictive validity, and reliability*, will give an account of the final ACiSD-Q's psychometric properties and quality (step four).

## 2. Theoretical Background (step 1)

Different interpretations of the concept of *action competence* have been described in the literature (Bonazzi Piasentin & Roberts, 2018). It has been viewed as an educational approach by some scholars (e.g. Ellis & Weekes, 2008) and as a competence of individuals and groups

by others (e.g. Chawla & Flanders Cushing, 2007; Cincera & Krajhanzl, 2013). In line with the stance we have taken in previous conceptual work on action competence, the current study draws from a definition of action competence as a competence of individuals and/or groups, focused on solving sustainable development issues (Sass et al., 2020a).

As such, action competence in sustainable development (ACiSD) is a complex concept that is composed of different subconcepts. In what follows we will describe these subconcepts before outlining the overall structure of ACiSD. Thus we will briefly zoom in on subconcepts action, sustainable development (SD), and competence within the concept of ACiSD. In this, we define competence as the relevant knowledge, willingness, and self-efficacy that are needed for contributing to sustainable development (Sass et al., 2020a).

Stern (2000) called for defining (environmentally significant) behavior as intent-oriented with a focus on subconcepts such as beliefs and motives. The behaviors that we call *action* fit that kind of definition, as they are not only decided upon by who acts, but also involve an intent to change a certain situation (Mogensen & Schnack, 2010) in order to solve an issue. This issue points at a certain risk for which there is no consensus on how to solve it (Hungerford & Volk, 1990). Consequently, an action cannot be imposed by others onto who acts, nor can behavior be called action unless it seeks to contribute to solving a so-called 'wicked problem'. Actions can aim to directly contribute (direct action) or to make others do so (indirect action). Someone who decides to buy Fairtrade performs a direct action, whereas activists who urge politicians to take measures for mitigating climate change, perform an indirect action. Furthermore, they can be performed individually (individual action) or in group (collectively). Moreover, the action taker can act as a private person, making choices in the private sphere, or as a citizen who takes civic action in the public sphere (ENEC, 2018; Hadjichambis et al., 2020; Stern, 2000). Both the volitional character and the aim for contributing to controversial problems or issues have consequences for the knowledge and kinds of willingness that are

needed in order to maintain the effort that is required (Breiting, Hedegaard, Mogensen, Nielsen, & Schnack, 2009; Jensen, 2000; Jensen & Schnack, 2006; Sass et al., 2020a). Consequently, it is the issue at stake that guides what kind of competence is needed to perform a certain action. When that problem is a *sustainable development* issue, relevant *knowledge* about the issue includes knowledge about different sustainable development aspects as well as the interrelations between those aspects. SD issues are described as complex problems that combine interrelated aspects from different areas, the so-called 5Ps: *Planet, People, Peace, Prosperity,* and *Partnership* (United Nations, 2015). Consequently, the knowledge referred to as relevant can be related to Bloom's *conceptual knowledge* as it asks for an understanding of concepts that include interconnections between subconcepts, or SD areas in this case (Anderson & Krathwohl, 2001). The area of planet focuses on risks of ecological degradation and climate change, and favors consumption-production models that support present and future generations' needs. Issues such as poverty, hunger, dignity, and equality are incorporated in the area of people. While peace regards peaceful, just, and inclusive societies, prosperity includes economic, social and technological progress in harmony with nature. Finally, partnership points at the need for solidarity and participation of all people and nations (UN, 2015, p. 2). In line with Howell (2013), who argues in favor of promoting a holistic view of a lower-carbon future for climate change mitigation campaigns to be successful, also policy documents concerning SD issues state the need for a holistic approach (UN, 2015). Next to such a holistic knowledge of SD issues, also knowledge about stakeholders is required, which involves what or who causes or is affected by the issue, and how (Jensen, 2000). Furthermore, action competent individuals or groups are skilled at finding information on what actions they can take to contribute to a possible solution (Jensen& Schnack, 2006). In this, a critical though optimistic stance is paramount concerning personal as well as societal values, while inspiration is also found in courses of action in

earlier times and in different cultures (Mogensen & Schnack, 2010). In order for this relevant knowledge to lead to action, (groups of) individuals need to be *willing* to contribute to sustainable development. This involves a strong personal motivation from within the action taker, and a level of commitment that allows them to continue their efforts regardless of obstacles or drawbacks (Moeller & Grassinger, 2013; Sass et al., 2020a; Vallerand, 2015). Finally, ACiSD is enhanced by confidence in one's own influencing possibilities (Breiting et al., 2009). This involves *self-efficacy*, which we define as confidence in individual or collective capacities to perform the action, i.e. *capacity expectations* (also called efficacy expectations), as well as in the effect that this action will exert, i.e. *outcome expectancy* (Bandura, 1977; Sass et al., 2020a).
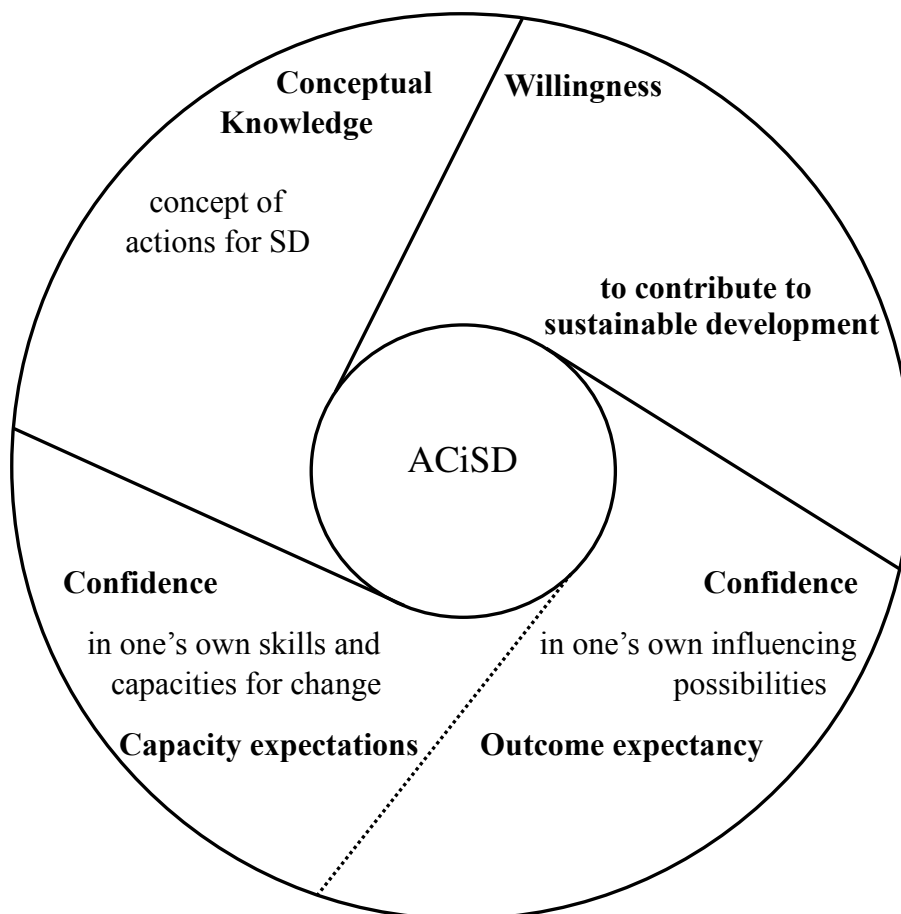


**Figure 1** Core features of ACiSD (after Sass et al., 2020a)

In sum, ACiSD is composed of 1) relevant knowledge, 2) willingness, 3) capacity expectations, and 4) outcome expectancy for contributing to sustainable development, as is illustrated in Figure 1.

## 3. Analytical Procedures

As mentioned in the *Introduction*, Furr's (2011) four procedural steps guided the construction and evaluation process of the ACiSD-Q. In a first step (see the Theoretical Background section), we articulated the construct of ACiSD with a population of 10- to 14-year-old respondents in mind, based on e.g. Mogensen & Schnack's seminal work (2010) and [Authors]. Step two involved the choice of response format and collection of an initial item pool. Thirdly, we collected data from respondents and examined psychometric properties and quality of the initial questionnaire. Finally, after adapting the questionnaire, in a fourth step, psychometric properties and quality of this version of the ACiSD-Q were verified again. Steps two to four drew from three different samples as can be seen in Table 1.

**Table 1** Description of samples for steps two, three, and four

|  | Step 2 (qualitative) | Step 3 (quantitative) | Step 4 (quantitative) |
|---|---|---|---|
| Schools: $n$ | 4 | 7 | 46 |
| Participants: $n$ | 75 | 403 | 1796 |
| Mean age | 12.5 | 11.5 | 11 |
| Gender (%): |  |  |  |
| male | 40% | 59% | 52% |
| female | 52% | 39% | 46% |
| undisclosed | 8% | 2% | 2% |
| Different countries of birth | 10 | 14 | 56 |
| Different languages spoken at home | 13 (69% Dutch incl. dialect; 12% multilingual; 16% speakers of other languages; undisclosed: 3%) | 17 (79% Dutch incl. dialect; 16% multilingual; 5% speakers of other languages) | 62 (65% Dutch incl. dialect; 27% multilingual; 8% speakers of other languages) |

i. In the first step, Sass et al.'s (2020a) extensive review of the literature on action competence and related concepts, such as Bandura's (2001) self-efficacy, and motivational theories (e.g. the commitment-passion model by Moeller & Grassinger, 2013; Vallerand's dual model of passion, 2015), guided our definition of ACiSD. In the current study, we reported on the conceptual understanding of ACiSD that resulted from this literature review in the *Theoretical Background* section. For a more elaborate account we refer to Sass et al. (2020a).

ii. The second step consisted of the generation of an initial item pool through a qualitative pre-study in collaboration with representatives from the target population ($n = 75$; for more details see Sass et al., 2020b). A selection of 11 initial items resulted from this pre-study.

iii. Thirdly, the items were assessed for content validity and linguistic adequacy by 7 educators experienced in environmental education, citizenship education, and education for sustainable development for the target population of grades 5 to 8, of which 3 were also experts on sustainable development. Then, a first version of the questionnaire was administered to two 10-year-old participants, which provided extra information on adequacy of phrasing and layout through a think aloud protocol. The questionnaire's items as well as the questions that were asked were rephrased based on this review process. The resulting questionnaire was piloted ($n = 403$) by administering it to the target population (grades 5 to 8) to further verify accuracy of the questionnaire's questions and items. Evaluation of this first version of the ACiSD-Q through observations during several administration sessions suggested some alterations to the items and the questions asked for tapping into self-efficacy. In the final version of the ACiSD-Q we opted for a 5-point Likert scale with a neutral center, which is a widely used and powerful response scale if the items are phrased in clear terms (Cohen, Manion, & Morrison, 2011; DeVellis, 2017).

iv.     Finally, an adapted version of the ACiSD-Q was administered to a third sample ($n = 1796$).

Rigorous statistical analyses were used to assess the instrument's psychometric properties.

*Ethical considerations and bias*

In all data collections (steps two to four) the ethical guidelines and advice of the researchers'

institution were observed (the University of Antwerp Ethics Committee for Social and Human

Sciences, approval number SHW_18_25). Participants' answers were only recorded and used

in analyses after thoroughly informed active consent was given by both the participants and

one of the parents. Consequently, previous to the start of any data collection participants

signed a form (for the qualitative pre-study) or ticked a box (quantitative study) indicating

they had been adequately informed about the research and consented with the use of the data

they were about to provide. The parents of all participants were asked to sign a form

confirming that they had been adequately informed and consented to the use of the data

provided by their participating child(ren). Both were also made aware that participation in all

research activities was voluntary, could be stopped at any moment of the research, and that

they could get access to any personal data collected. A Privacy Officer was appointed, who

oversaw ethical aspects of the research throughout.

The researchers and teachers involved in the data collections were instructed to make clear to

all participants that we were interested in them, in what they thought and felt about actions for

sustainable development, and not in what they thought adults would like them to think or feel.

Furthermore, all participants were guaranteed anonymity in order to avoid social desirability

bias. In steps three and four (surveys), participants were asked not to communicate with each

other while completing the questionnaires to prevent peer pressure (Scott, 2008).

## 4. Generation of an initial item pool (step 2)

This qualitative pre-study aimed at exploring what actions for sustainable development representatives of the target population would view as viable for someone their age in order to generate an initial item pool of age-appropriate SD issues and actions.

### 4.1. Sample and procedure

Purposive sampling resulted in four class groups across three schools willing to cooperate: primary education was represented by two fifth and one sixth grades, secondary education by a seventh grade class. Schools were located in a suburban town and in one of the larger Belgian cities in the province of Antwerp, and selected for diversity in educational approach (traditional, student-centered, artistic) and student backgrounds. This pre-study included 75 participants with a mean age of 12.5. Of this sample 40% were male, 52% female, and 8% did not disclose their gender. Ten different countries were indicated as place of birth, and thirteen different languages as first language used at home (69% Dutch, i.e. the language used at school, 12% bi- or multilingual, 16% monolingual speakers of other languages, 3% undisclosed).

First, in each of the four class groups a group discussion of what sustainable development (SD) meant to each of the participants ensured a common understanding of this concept. Then, participants were each asked individually to select an SDG they considered as most urgent, and to decide what action they would like to take to contribute to a solution. In the next phase, they could choose either to continue working individually or in groups of up to four. Finally, they presented (either individually or in group) their action for SD to the researcher (first author) and each other. The resulting 30 presentations were recorded and transcribed verbatim, including a description of any artwork made and information and audiovisual materials shared during the presentations.

*4.2. Data analyses*

We performed the data analyses using software program NVivo 12. A deductive approach was adopted, which is suitable for detailed analysis intended to answer our specific research question (Braun & Clarke, 2006), i.e. what actions for SD early adolescents consider viable for someone their age. Informed by a conceptualization of actions for SD as described in the *Theoretical Background* section, two researchers developed the coding tree. They collaborated to code and validate seven random fragments (about 23% of all observations), after which they refined the analysis categories. Reliability of analyses was guaranteed through independent coding of the remaining observations by both researchers. Categories that did not show sufficient intercoder agreement were discussed again and further finetuned until a Cohen's kappa of .76 was reached, which is considered sufficient reliability for further analysis in line with recommendations by Landis & Koch (1977).

*4.3. Results*

As outlined in the *Theoretical Background* section, sustainable development consists of different interrelated aspects concerning environmental (planet), social (people), peace, prosperity, and partnership issues (UN, 2015). As shown in Table A1 (in the Appendix), SD actions suggested by the early adolescents participating in this pre-study, covered all these, although partnership and prosperity were mentioned only implicitly, or as a means to contribute to another environmental, social, or peace goal. This is why we opted for focusing on those actions that targeted environmental, social, and peace issues as suggested by the participants to this qualitative research step. Moreover, in the current study the researchers selected items based on the extent to which they were put in terms of concrete actions rather than abstract ideas. Consequently, the eleven items that were selected to form the initial item pool covered actions concerning the environment (5 items), social (3 items), and peace issues (3 items) as can be seen in Table 2.

**Table 2** The 11 items in the initial version of the action competence in sustainable development questionnaire and subconstructs (ACiSD-Q; step 2; English translations by first author)

| ACiSD subconstruct | item | |
|---|---|---|
| Conceptual Knowledge | | Do you think this can provide a better life for people without causing damage to the planet? |
| Conceptual Knowledge Planet | K3 | … save money to buy an electric means of transport instead of something with a petrol-powered engine. |
| | K4 | … save electricity and water at home. |
| | K5 | … swap clothes that I don't use any more, with friends. |
| | K9 | … collect litter from the streets with friends. |
| | K10 | … only use toiletries from brands that don't experiment on animals. |
| Conceptual Knowledge People | K6 | … give clothes they don't use any more to people that live in poverty here with us. |
| | K8 | … organize a jumble sales and donate the profit to a charity. |
| | K11 | … treat boys and girls as equal. |
| Conceptual Knowledge Peace | K1 | … use social media (such as YouTube) to convey a message for peace. |
| | K2 | … develop an action against bullying at school. |
| | K7 | … give clothes they don't use any more to people who have fled from war. |
| Willingness | | Do you want to do this? |
| Willingness Planet | W3 | … save money to buy an electric means of transport instead of something with a petrol-powered engine. |
| | W4 | … save electricity and water at home. |
| | W5 | … swap clothes that I don't use any more, with friends. |
| | W9 | … collect litter from the streets with friends. |
| | W10 | … only use toiletries from brands that don't experiment on animals. |
| Willingness People | W6 | … give clothes they don't use any more to people that live in poverty here with us. |
| | W8 | … organize a jumble sales and donate the profit to a charity. |
| | W11 | … treat boys and girls as equal. |
| Willingness Peace | W1 | … use social media (such as YouTube) to convey a message for peace. |
| | W2 | … develop an action against bullying at school. |

| | | |
|---|---|---|
| | W7 | … give clothes they don't use any more to people who have fled from war. |
| **Capacity Expectations** | | Would you be capable of doing this if no one or nothing stops you? |
| Capacity Expectations Planet | CE3 | … save money to buy an electric means of transport instead of something with a petrol-powered engine. |
| | CE4 | … save electricity and water at home. |
| | CE5 | … swap clothes that I don't use any more, with friends. |
| | CE9 | … collect litter from the streets with friends. |
| | CE10 | … only use toiletries from brands that don't experiment on animals. |
| Capacity Expectations People | CE6 | … give clothes they don't use any more to people that live in poverty here with us. |
| | CE8 | … organize a jumble sales and donate the profit to a charity. |
| | CE11 | … treat boys and girls as equal. |
| Capacity Expectations Peace | CE1 | … use social media (such as YouTube) to convey a message for peace. |
| | CE2 | … develop an action against bullying at school. |
| | CE7 | … give clothes they don't use any more to people who have fled from war. |
| **Outcome Expectancy** | | Is there anyone or anything that would stop you? |
| Outcome Expectancy Planet | OE3 | … save money to buy an electric means of transport instead of something with a petrol-powered engine. |
| | OE4 | … save electricity and water at home. |
| | OE5 | … swap clothes that I don't use any more, with friends. |
| | OE9 | … collect litter from the streets with friends. |
| | OE10 | … only use toiletries from brands that don't experiment on animals. |
| Outcome Expectancy People | OE6 | … give clothes they don't use any more to people that live in poverty here with us. |
| | OE8 | … organize a jumble sales and donate the profit to a charity. |
| | OE11 | … treat boys and girls as equal. |
| Outcome Expectancy Peace | OE1 | … use social media (such as YouTube) to convey a message for peace. |
| | OE2 | … develop an action against bullying at school. |

| | |
|---|---|
| OE7 | … give clothes they don't use any more to people who have fled from war. |

## 5. Piloting the initial measurement instrument (step 3)

The objective of this pilot study was to develop a questionnaire tapping into the ACiSD of 10- to 14-year-olds. A second aim was to examine readability as well as content validity of the initial measurement instrument, that consisted of 11 items describing actions for sustainability with a main focus on environmental (planet), social (people), and peace concerns (see Table 2). Given the young age of our participants, all items were phrased positively in order to avoid confusion (DeVellis, 2017). As we wanted to measure conceptual knowledge, we asked students to what extent they would classify a number of actions as actions for SD (Anderson & Krathwohl, 2001). In all, four questions tapped into action competence categories of conceptual knowledge of action possibilities, willingness, and self-efficacy (i.e. capacity expectations and outcome expectancy):

A. Do you think this can provide a better life for people without causing damage to the planet?

B. Do you want to do this?

C. Would you be capable of doing this if no one or nothing stops you?

D. Is there anyone or anything that would stop you?

When researching youth, the researcher should be aware of the methodological problems regarding language use, literacy and cognitive development (Scott, 2008). Therefore, we assessed accuracy of the initial questionnaire in terms of age-appropriateness of the language. In this, we focused on semantic and syntactic aspects of the statements tapping into AC

categories of conceptual knowledge, willingness, capacity expectations, and outcome

expectancy, as well as of the items that referred to SD dimensions planet, people, and peace.

*5.1. Sample and procedure*

First, a panel of experts verified items and questions for adequacy of content and accuracy of

language. This panel included professionals knowledgeable about sustainable development as

well as experts in environmental and citizenship education (DeVellis, 2017). Second, a ten-

year-old boy and girl filled the questionnaire while thinking aloud, which is a cognitive

pretest method to examine how the questions are understood and answered (Scott, 2008).

Additionally, drawing from actions for sustainability that were suggested by early adolescents

themselves for the generation of the item pool, enabled us to avoid an adult-centric

perspective (Scott, 2008). Finally, the adapted questionnaire was administered to 403

respondents across seven schools during a class period at the schools. A researcher and the

class teacher were present during administration. The participating schools could opt either

for administration on paper ($n = 207$) or online ($n = 196$). For reasons of reliability teachers

and researchers present during administration all received the same instructions. They could

offer technical assistance only, such as helping respondents with how to read a table or how to

log in when filling the questionnaire online, but help with interpreting questions or items was

not allowed. Participants were in grades 5 to 8 (mean age = 11.5). Of this sample 59% were

male, 39% female, and 2% did not disclose their gender. Fourteen different countries were

indicated as place of birth, and seventeen different languages as first language spoken at home

(79% Dutch, i.e. the language used at school, 16% bi- or multilingual, 5% monolingual

speakers of other languages).

*5.2. Data analyses*

Conceptual considerations and observations during administration guided alterations to the

questionnaire. Moreover, reliability of subconstruct measurement (conceptual knowledge,

willingness, capacity expectations, and outcome expectancy) was verified through calculation of Cronbach's alphas.

*5.3. Results*

Observations by the teachers and researchers present during administration provided useful information about age-appropriateness of the questionnaire's phrasing of items and questions asked. In order to avoid possible lexical problems, examples had been added in several items (e.g. items 3, 10, and 11). However, this appeared to complicate reading comprehension as it resulted in too complex syntaxis. Teachers and researchers present at administration reported problematic lexical and syntactic complexity of certain items (e.g. item three: *Save money to buy an electric means of transport (for example: bicycle, moped, car) instead of something with a petrol-powered engine).* These items were rephrased as was item five ('*Swap clothes that have become too small for me or that I don't like anymore, with friends.'*) that showed ambiguity. We refer to Table 3 for an overview of all rephrased items.

**Table 3** Overview of rephrased items (step 2; English translations by first author)

| Original item (English) | Rephrased item (English) |
|---|---|
| 3. Save money to buy an electric means of transport (for example: bicycle, moped, car) instead of something with a petrol-powered engine. | 3. Save money to buy an electric means of transport instead of something with a petrol-powered engine. |
| 5. Swap clothes that have become too small for me or that I don't like anymore, with friends. | 5. Swap clothes that I don't use any more, with friends. |
| 6. Give clothes I don't like anymore or that have become too small to people who live in poverty here with us. | 6. Give clothes I don't wear anymore to people who live in poverty here with us. |
| 7. Give clothes I don't like anymore or that have become too small to people who have fled from war. | 7. Give clothes I don't wear anymore to people who have fled from war. |
| 10. Only use toiletries (e.g. sun cream, shampoo, soap, make-up, body milk,…) from brands that don't experiment on animals. | 10. Only use toiletries from brands that don't experiment on animals. |

| | |
|---|---|
| 11. Treat boys and girls as equal, even when they're different. E.g.: bold, wearing glasses, gay, lesbian,… | 11. Treat boys and girls as equal. |

Moreover, questions were rephrased from question to statement to better align them with the answer scale options of different degrees of (dis)agreement.

Finally, Cronbach's alpha values pointed at good reliability for the measurement of subconstructs conceptual knowledge (.75), willingness (.75), and capacity expectations (.77), but this was problematic for outcome expectancy (.67). Consequently, the question tapping into outcome expectancy (*Is there anyone or anything that would stop you?*) was rephrased (*I contribute to a good life for everyone without damaging the planet if I…*) to fit the concept better. Given the interconnected nature of subcategories, i.e. environmental, social, and peace aspects, within the concept of sustainable development, we opted for 5-point Likert scales for answering questions tapping into the AC subconcepts of conceptual knowledge, willingness, capacity expectations, and outcome expectancy.

## 6. Final instrument evaluation: construct and predictive validity, and reliability (step 4)

In this final step, we aimed to examine construct and predictive (also referred to as criterion-related) validity, as well as reliability of the final instrument that consisted of 11 items related to environmental (planet), social (people), and peace aspects of sustainability issues (see Table 2), and four statements tapping into action competence categories of conceptual knowledge, willingness, and self-efficacy subconstructs capacity expectations and outcome expectancy. The respective statements were:

A. People contribute to a good life for everyone without damaging the planet if they…

B. I want to…

C. I can…

D. I contribute to a good life for everyone without damaging the planet if I…

Respondents expressed (dis)agreement with the statements through a 5-point Likert scale (1= completely disagree, 3 = don't agree/don't disagree, 5 = completely agree for conceptual knowledge, willingness, and outcome expectancy; 1 = certainly not, 2 = I don't think so, 3 = maybe, 4 = I think so, 5 = certainly for capacity expectations).

## 6.1. Sample and procedure

The final version of the ACiSD-Q was administered to 1796 participants in grades 5 to 8 (mean age = 11) across 46 schools in each of the 5 Flemish provinces. Of this sample 52% were male, 46% female, and 2% did not disclose their gender. Fifty-six different countries were indicated as place of birth, and 62 different languages as first language used at home (65% Dutch, i.e. the language used at school, 27% bi- or multilingual, 8% monolingual speakers of other languages).

The questionnaire was administered by the class teacher in the classroom during one class period. All teachers received the same instructions to enhance reliability. As in step 3, they could give technical assistance, but were asked not to help respondents with interpreting items or questions. The participating schools could again opt either for administration on paper (*n* = 1406) or online (*n* = 390). Efforts were made to reduce missingness. The paper questionnaires highlighted the need for answering all questions and provided information on how many answers should have been given on each page of the questionnaire so that participants could eliminate any accidental oversights. Regarding the online questionnaires we opted for forced responses.

## 6.2. Statistical analyses and measures

Preliminary analysis of the data showed a low percentage of missingness in the items of the measurements used in this step. Highest incidence of missingness did not exceed 1% of all

cases for the ACiSD-Q and SCQ-S behavior, and 1.4% for the 2-MEV items. Calculation of skewness and kurtosis for examining distribution of the data showed non-zero distributions (negative skewness). For this reason and because the data were considered ordinal (5-point Likert answer scales), we performed robust Confirmatory Factor Analysis (CFA) in RStudio version 3.5.2. to assess *construct validity* of the ACiSD-Q. For a non-normal distribution of ordinal data, diagonally weighted least squares estimation produces more accurate model estimations than maximum likelihood (Mîndrilă 2010). Factor loadings guided a reduction of the items so that measurement of all subconstructs consisted of three items per sustainable development category (planet, people, and peace). As recommended by Brown (2015) we looked into different types of fit indices. Standardized Root Mean Square Residual (SRMSR) was the absolute fit index computed, and Root Mean Square Error of Approximation (RMSEA) was examined as a parsimony correction index. Furthermore, we calculated two comparative fit indices, i.e. the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI; also called Non-Normed Fit Index or NNFI). Cut-off values $\leq$.08 (SRMR and RMSEA), and $\geq$.95 (CFI and TLI) were used as indicative of good to reasonable fit (Brown, 2015). We started with performing twelve CFAs, i.e. one for each action competence subconstruct (knowledge, willingness, capacity expectations, and outcome expectancy) for items grouped into planet, people, or peace subconstructs of sustainable development. For reasons of parsimony, we then calculated mean sumscores for each of these subconstructs. Based on the theory on action competence as outlined in the *Theoretical Background* section, we then assessed a first model, in which ACiSD consisted of subconstructs conceptual knowledge, willingness, and self-efficacy, with the latter consisting of subconstructs capacity expectations and outcome expectancy (see Figure 2). Modification indices guided improvement of the model until the model fitted the data acceptably. Based on the final model, we estimated Pearson's correlation coefficients to assess correlations between latent action competence

subconstructs (conceptual knowledge, willingness, capacity expectations, and outcome expectancy). Latent factor correlations below .80 indicate acceptable discriminant validity (Brown, 2015; DeVellis, 2017). Finally, we calculated Cronbach's alpha's for ACiSD and its subconstructs to examine reliability of the measurement. We also provide descriptives (means
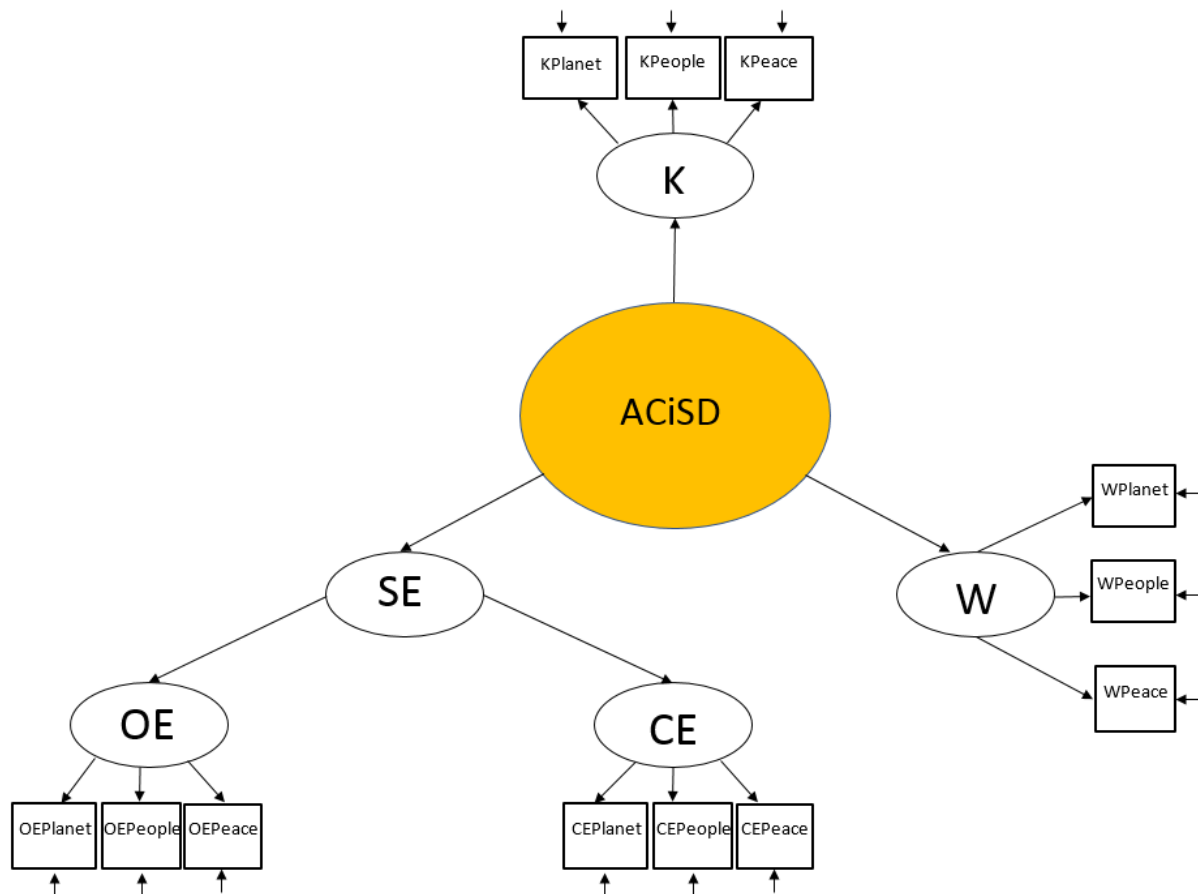


**Figure 2** Theorized three-order model of Action Competence in Sustainable Development (ACiSD) constructs. The model consists of latent variables self-efficacy (SE), conceptual knowledge (K), and willingness (W). Self-efficacy consists of two subconstructs capacity expectations (CE) and outcome expectancy (OE). The first-order variables consist of items categorized into environmental (Planet), social (People), or peace aspects of sustainable development.

and standard deviations) for each item and subconstruct.

*Predictive and discriminant validity* are an additional assessment of construct validity that looks into associations between the new measurement instrument and a presumed standard (DeVellis, 2017, p. 93). Predictive and discriminant validity of our instrument were assessed by estimating correlations between the latent factors of the final nine-item ACiSD and two well-validated constructs, i.e. both the Preservation and Utilization subconstructs of the two-dimensional Model of Ecological Values (2-MEV; Wiseman & Bogner, 2003) and the

behavior construct of the Sustainability Consciousness Questionnaire short version (SCQ-S; Gericke et al., 2019). Therefore, a CFA was computed of the final ACiSD model which was extended with the additional items and latent variables of the 2-MEV and the SCQ-S-behavior measurement to assess correlations between the latent constructs of the ACiSD, Utilization and Preservation (2-MEV), and SCQ-S-behavior. Additionally, we calculated the Heterotrait-monotrait (HTMT) ratio of correlations, which is considered a more efficacious method for assessing discriminant validity (Henseler, Ringle, & Sarstedt, 2015). In what follows we describe both measurement instruments.

The *two-dimensional Model of Ecological Values*, or *2-MEV* (Torkar & Bogner, 2019; Wiseman & Bogner, 2003) consists of an ecocentric (Preservation) and an anthropocentric (Utilization) dimension. The two dimensions are uncorrelated. The Preservation (ecocentric) dimension expresses the value of conservation and preservation of the environment, whereas Utilization (anthropocentric) points toward the use of natural resources for the benefit of mankind (Wiseman & Bogner, 2003).

The short version of the *Sustainability Consciousness Questionnaire (SCQ-S*; Gericke et al., 2019) consists of three dimensions, i.e. a sustainability knowledge (called knowingness), a sustainability attitude, and a *sustainability behavior* dimension. Each dimension builds on environmental, social, and economic aspects of sustainable development. Similar to the ACiSD measurement instrument developed in this study, the development of the SCQ-S drew largely from the UNESCO framework for SD, and content was verified to cover all topics of this framework (Gericke et al., 2019).

We expected the ACiSD to correlate positively with the 2-MEV Preservation and the Behavior constructs of the SCQ-S. Conversely, we expected to find no correlations with 2-MEV's Utilization.

*6.3. Results*

Two items referring to the planet dimension of sustainable development were removed so that each sustainable development subconstruct (planet, people, and peace) was measured by three items. Items three and five were removed as their factor loadings were lowest in comparison to the other three items that were retained (conceptual knowledge: 0.41 and 0.43, willingness: 0.44 and 0.51, capacity expectations: 0.39 and 0.50, and outcome expectations: 0.42 and 0.49) in all planet subconstructs. Hence, items three, i.e. *'save money for buying an electrical means of transport instead of one with a petrol-driven engine'* and five, i.e. *'swap clothes I don't wear anymore with friends'*, were deleted. Computation of 12 CFAs for the first order constructs conceptual knowledge, willingness, capacity expectations, and outcome expectancy for SD dimensions planet, people, and peace showed perfect fits. For reasons of parsimony, we started with calculating the mean sumscores of planet, people, and peace items for each of the action competence subconstructs (conceptual knowledge, willingness, capacity expectations, and outcome expectancy). Several models were compared, starting from the theorized model (see Figure 2). Conceptual considerations and modification indices guided the finetuning process of the model. Modification indices indicated that the base model could be improved by adding covariances between AC subconstructs regarding the SD planet dimensions. Models were gradually extended, each time adding one covariance to the previous model. In a second model, correlations between capacity expectations and outcome expectancy were added. Thus, a second model included covariances between capacity expectations and outcome expectancy, which was complemented by covariances between conceptual knowledge and willingness in a third model. In a fourth, a fifth, a sixth, and a seventh model covariances between conceptual knowledge and outcome expectancy, willingness and outcome expectancy, conceptual knowledge and capacity expectations, and willingness and capacity expectations completed the model. This yielded a final model that

started from average scores for conceptual knowledge planet, conceptual knowledge people, conceptual knowledge peace, and similarly for willingness, capacity expectations, and outcome expectancy. The following six models gradually added covariances between the same action competence subconstructs regarding the peace issues. Figure 3 shows the final third-order ACiSD model with standardized factor loadings. It includes measurement of
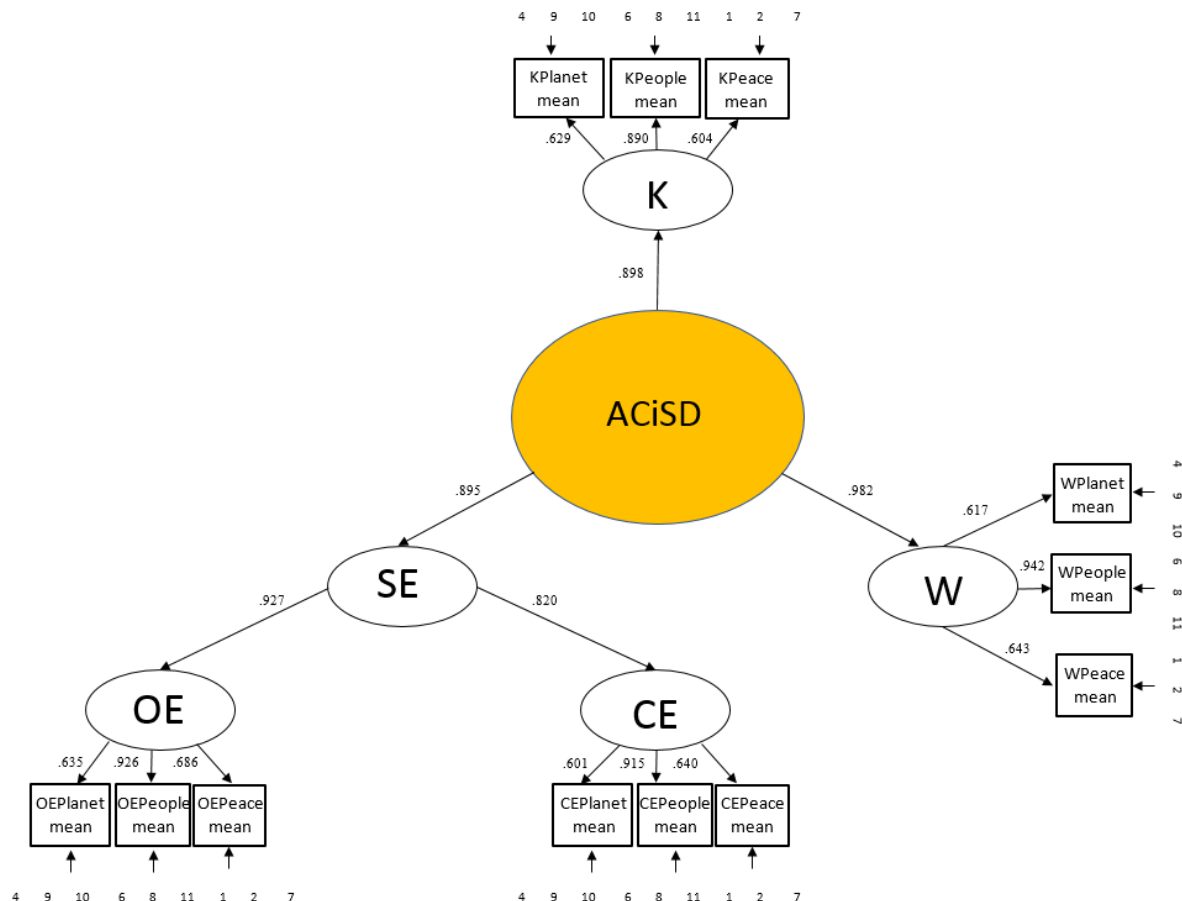


**Figure 3** CFA model of the Action Competence in Sustainable Development Questionnaire (ACiSD-Q) with standardized factor loadings. ACiSD = action competence in sustainable development; K = conceptual knowledge of actions for SD; W = willingness; SE = self-efficacy; CE = capacity expectations; OE = outcome expectancy; _mean = mean sumscores; KPlanet = conceptual knowledge of environmental actions; WPlanet = willingness to contribute to environmental actions; CEPlanet = capacity expectations regarding environmental actions; OEPlanet = outcome expectancy for environmental actions; KPeople = conceptual knowledge of social actions; WPeople = willingness to contribute to social actions; CEPeople = capacity expectations regarding social actions; OEPeople = outcome expectancy for social actions; KPeace = conceptual knowledge of actions for peace; WPeace = willingness to contribute to actions for peace; CEPeace = capacity expectations regarding actions for peace; OEPeace = outcome expectancy for actions for peace. Numbers (4, 9, 10, 6, 8, 11, 1, 2, and 7 refer to the items used in the final model (also see Table 2). Error covariances between conceptual knowledge, willingness, capacity expectations, and outcome expectancy of planet and peace items are not represented here for reasons of clarity.

action competence subconstructs conceptual knowledge, willingness, capacity expectations, outcome expectancy, and self-efficacy regarding environmental (planet), social (people), and peace issues, and correlations between measurement of all action competence subconstructs

(i.e. conceptual knowledge, willingness, capacity expectations, and outcome expectancy) regarding environmental and peace issues. Self-efficacy consisted of the items measuring subconstructs capacity expectations and outcome expectancy.

This model aligned with the concepts as described in section *Theoretical Background*. As can be seen in Figure 3, standardized loadings of the latent variables ranged from 0.601 for third-order construct capacity expectations regarding environmental actions to 0.982 for first-order construct willingness to contribute to sustainable development. All loadings were significant at the $p$ <.001 level.

**Table 4** Model fit indices for the final third-order ACiSD-Q model and combined ACiSD-Q, Utilization, Preservation, and Sustainability Behavior model (step 4)

| | $\chi^2$ | CFI | | TLI | | RMSEA | | SRMR | |
|---|---|---|---|---|---|---|---|---|---|
| | | Standard | Robust | Standard | Robust | Standard | Robust | Standard | Robust |
| Final third-order model: ACiSD with error covariances between all environmental (planet) and peace subconstructs (conceptual knowledge, willingness, capacity expectations, and outcome expectancy) | 386.132 *df* = 37 *p* = 0.00 | 0.998 | 0.988 | 0.996 | 0.979 | 0.054 *p* =0.164 | 0.075 *p* =0.000 | 0.030 | 0.030 |
| ACiSD, Utilization, Preservation, and Sustainability Behavior | 3783.470 *df* = 603 *p* = 0.00 | 0.975 | 0.929 | 0.973 | 0.922 | 0.061 *p* =0.00 | 0.058 *p* =0.000 | 0.058 | 0.058 |

This final model was validated with good to adequate model fit estimates (Brown, 2015) resulting from robust analyses, using diagonally weighted least square estimation ($\chi^2$ = 386.132, *df* = 37, *p* <.001, SRMR = 0.030, RMSEA = 0.075 with *p* <.001, CFI = 0.988, TLI = 0.979). Table 4 provides the standard and robust estimations with diagonally weighted least squares for all model fit indices. Also when this final model was extended by the measurement instruments 2-MEV and Sustainability behavior, validation through calculation

of CFA showed good model fit ($\chi^2$ = 3783.470, $df$ = 603, $p$ <.001, SRMR = 0.058, RMSEA = 0.058 with $p$ <.001, CFI = 0.929, TLI = 0.922).

Correlations between the action competence latent subconstructs (see Table 5) showed strong correlations between measurement of all action competence subconstructs regarding actions for sustainable development, with highest values for the correlation between conceptual knowledge about and willingness to contribute to actions for sustainable development (.79), and lowest values for the correlation between conceptual knowledge and capacity expectations (.58). Conceptual knowledge correlated stronger with outcome expectancy (.69) than with capacity expectations (.58). Correlation between willingness and outcome expectancy (.75) was also stronger than with capacity expectations (.66), which was comparable to the correlation between capacity expectations and outcome expectancy (.68). All correlations were significant at the <.0001 level.

**Table 5** Pearson's correlations of ACiSD variables conceptual knowledge of actions for sustainability, willingness, capacity expectations, and outcome expectancy (step 3, $n$ = 1796). Note: * Correlation is significant at the <.0001 level

| ACiSD | Conceptual Knowledge | Willingness | Capacity expectations |
|---|---|---|---|
| Willingness | .79* | | |
| Capacity expectations | .58* | .66* | |
| Outcome expectancy | .69* | .75* | .68* |

Furthermore, Pearson's correlations were calculated for all pairs of subconstructs regarding environmental and peace actions, i.e. conceptual knowledge, willingness, capacity expectations, and outcome expectancy. All correlations were significant at the $p$<.0001 level and showed strong correlations ranging from .58 and .42 between conceptual knowledge and capacity expectations regarding environmental and peace actions respectively, to .75 (planet)

and .64 (peace) for conceptual knowledge about and willingness to contribute to environmental actions. However, the latent factor correlations did not exceed .80, which confirmed that also the factors tapping into conceptual knowledge, willingness, capacity expectations, and outcome expectancy regarding environmental and peace issues showed acceptable discriminant validity (Brown, 2015; DeVellis, 2017).

Based on the final 36-item (i.e. 4 questions tapping into AC about 9 statements regarding actions for SD) model *predictive and discriminant validity* were assessed through computation of correlations between the ACiSD-Q and two well-validated constructs, i.e. the two-dimensional Model of Ecological Values (2-MEV; Wiseman & Bogner, 2003) and the behavior subconstruct of the Sustainability Consciousness Questionnaire's short version (SCQ-S; Gericke et al., 2019).

**Table 6** Latent factor correlations of ACiSD with Utilization, Preservation (2-MEV), and Sustainability Behavior (SCQ-S) and heterotrait-monotrait (HTMT) ratio of correlations between brackets
Note: [ns] Correlation is non-significant; * Correlation is significant at the <.05 level; ** Correlation is significant at the $\leq$.001 level

| | 2-MEV | | SCQ-S Sustainability Behavior |
| --- | --- | --- | --- |
| | Utilization | Preservation | |
| 2-MEV Preservation | -.10** (.17) | | |
| SCQ-S Sustainability Behavior | -.01[ns] (.15) | .78** (.77) | |
| ACiSD | - .06* (.14) | .69** (.67) | .80** (.75) |

As expected, analyses showed significant ($p$ < .001) strong correlations between the ACiSD and Preservation (.69; HTMT: .67), and also between ACiSD-Q and Sustainability Behavior (.80; HTMT: .75). Conversely, the ACiSD-Q did hardly correlate with Utilization (-.06; HTMT: .14). The correlations did not exceed .80 (for Pearson's correlations) or .85 (for HTMT), which confirmed that the ACiSD-Q measures different constructs when compared to

preservation and utilization attitudes as measured by the 2-MEV, and sustainability behavior as measured by the SCQ-S. Moreover, the correlation of latent factor Sustainability behavior with Utilization was non-significant. Table 6 provides latent factor and HTMT ratio of correlations for Utilization, Preservation, Sustainability Behavior, and ACiSD.

In Flanders, the Dutch-speaking north of Belgium, early adolescents agreed that the actions suggested would contribute to sustainable development (*means* = 4.1). They were willing to contribute (*means* = 3.9) and were confident about their capacities for performing the suggested actions (*means* = 3.8), which they also felt would reach the aim of 'providing a good life for everyone without damaging the planet' (*means* = 3.9). Overall, they did not show great disagreement in any of the subconstructs. Still, they tended to disagree most when considering the use of toiletries from brands that used animal testing as unsustainable consumption (*sd* = 1.16 for conceptual knowledge; 1.25 for willingness; 1.23 for capacity expectations; 1.19 for outcome expectancy). They most strongly agreed about gender equality (*sd* = .81 for conceptual knowledge and willingness; *sd* = .92 for capacity expectations; *sd* = .94 for outcome expectancy), although agreement was even higher when expecting that their saving electricity and water at home would contribute to SD (*sd* = .91). For an overview of descriptives and Cronbach's alphas, we refer to Table A2 in the Appendix.

## 7. General Discussion

Based on our analyses, we found the 36-item ACiSD-Q both valid and reliable for measuring action competence in sustainable development within early adolescents, aged ten to fourteen. Respondents indicate the extent of their (dis)agreement to four statements that tap into action competence subconcepts of conceptual knowledge, willingness, capacity expectations, and outcome expectancy. The statements each focus on nine items covering sustainable development subconcepts of actions that contribute to finding a solution for environmental (planet), social (people), and peace issues. Agreement or disagreement is expressed by means

of a five-point Likert scale with a neutral center. Compared to the 2-MEV and the SCQ-S, two well-established measurement instruments, this novel instrument measures similar, yet different constructs. While the 2-MEV focuses uniquely on environmental attitudes, the ACiSD-Q measures a more complex concept of action competence in sustainable development. Hence, this novel instrument broadens the scope, adding social and peace issues to environmental concerns. It also differs from the SCQ in that it drew from the perspective of the target population (early adolescents), whereas the SCQ took an adult perspective based on the literature. Similarly to the SCQ, the ACISD-Q represents sustainability issues through concrete actions for SD, which also makes it different from the SPACS, that measures ACiSD generically, referring to 'sustainable development' as an abstract concept rather than in concrete terms. In sum, the ACiSD-Q distinguishes itself from other measurement instruments in that it 1) drew from the perspective of its target population of early adolescents, 2) combines the complex concepts of action competence and sustainable development, and does so 3) through a representation by concrete actions for SD.

## 7.1. Contribution and potential implications

The current study contributed with the development of a psychometrically sound measurement instrument for assessing ACiSD within early adolescents, while acknowledging the complexity of the concepts of action competence and sustainable development. Whereas other measurement instruments focused on environmental issues, or were aimed at a (young) adult population, the ACiSD-Q integrates the concepts of action competence and sustainable development in a way that is suitable for a younger audience. Moreover it is unique in taking the perspective of early adolescents on concrete possible actions for sustainable development.

Schools struggle with the transition from prescribing what is the 'right' behavior to empowering students so they are capable of taking action. ESD, however, strives for learners to form their own well-informed opinions, so they can act upon them (Berglund & Gericke,

2018). In Sweden, evidence of more frequent sustainability behavior was found, when ESD principles of pluralism were implemented. This means that learners and educators jointly decide on topics, and different points of view are welcomed (Boeve-de Pauw, Gericke, Olsson, & Berglund, 2015). In view of the strong correlation between ACiSD and sustainability behavior found in this study, the ACiSD-Q can help monitor these efforts, measuring ACiSD as a learning outcome of ESD implementation as well as monitoring the quality of a voluntary behavior that aims to contribute to SD.

Furthermore, scholars and change program developers can opt to use the measurement instrument presented here to map not only the overall action competence within their early adolescent target audience, but also their conceptual knowledge of action possibilities, willingness, capacity expectations, and outcome expectancy regarding actions for sustainable development. This can offer scholars a more detailed insight in how these aspects affect overall ACiSD. For educators and developers of change programs it can guide assessment of which aspects of the educational approach or change program intervention need finetuning to increase overall AC or AC subconstructs of early adolescent students or participants.

### 7.2. Limitations and future research

Notwithstanding our efforts for rigor, we also need to acknowledge some limitations. The relatively young age of the target population posed extra strain on the size of the questionnaire. Consequently, the number of items that could be included was limited, which inhibited presentation of a larger initial item pool to the participants. However, we benefitted from much valued feedback from experts in SD, ESD, and education for early adolescents in our efforts to enhance content validity. Furthermore, this study was set in Flanders, which is a relatively urban context that has not seen many major direct influences of issues such as climate change yet. This circumstance and the young age of the participants to the qualitative pre-study used for item generation may also have been reflected in the SD actions represented

by the items. Connections between planet and peace (e.g. climatic conditions leading to people fleeing their homes or war) were not presented by the early adolescents. It would be interesting to replicate this qualitative step with adult participants to find out whether they would suggest SD actions that address this connection. Notwithstanding this limitation, the ACiSD-Q complements existing measurement instruments that were developed from an adult point of view with early adolescents' own perspectives on SD actions. Finally, sustainability behavior was measured through self reports, which can be regarded as indicative but not as a substitute for real behavior.

Further qualitative and quantitative research is needed to refine the psychometric properties of the ACiSD-Q. A replication of the qualitative pre-study (step 2) within older populations and in regions that have been more visibly and dramatically affected by climate change, may add different and more advanced actions for sustainable development (i.e. items) linking environmental, social, and peace aspects of SD. We also call for assessment of the connection between ACiSD and real behavior (step 4), as well as for examination of how and which ESD principles influence what ACiSD subconcepts. Finally, administration in other national settings would provide cross-cultural validation of the instrument proposed in this study.

## 8. Conclusions

In times when the natural world is at risk, action is called for (Chawla, 2009). Action is a volitional behavior that aims to solve controversial problems (Hungerford & Volk, 1990; Jensen, 2000; Mogensen & Schnack, 2010). Finding sustainable solutions to environmental problems may give rise to such controversy, when environmental, social, and socio-economic perspectives serve opposing interests. Consequently, if individuals and groups are to contribute to sustainable development, they should be willing to contribute to solving SD issues, while knowing about action possibilities, and feeling they are capable of acting effectively. In other words, they need to show action competence in sustainable development

(ACiSD). As civic involvement is shaped in childhood, while individuals start looking at peers for role models instead of at their parents in early adolescence, we were interested in ten to fourteen-year-olds. Therefore, answering Sass et al.'s (2020a) call for an operationalization of ACiSD into a measurement instrument, the aim of the current study was to report on the development of a theoretically grounded and empirically validated instrument for measuring ACiSD within ten to fourteen-year-olds, i.e. the ACiSD questionnaire (ACiSD-Q).

The ACiSD-Q was found a valid and reliable instrument for measuring action competence in sustainable development within ten to fourteen-year-olds. It consists of four statements tapping into action competence subconcepts of conceptual knowledge, willingness, and self-efficacy (i.e. capacity expectations and outcome expectancy). Respondents express their (dis)agreement with nine statements regarding actions for sustainable development (three for environmental, three for social, and three for peace issues).

With the development of this novel instrument for measuring early adolescents' action competence in sustainable development, we have provided a measurement and monitoring tool for scholars, educators, and developers of change programs for early adolescents with a focus on sustainable development. Scholars interested in sustainability behavior can get useful information on how action competence affects behavior. Education for sustainable development implementation can make use of the ACiSD-Q to monitor learning outcomes. Finally, policy makers focusing on social trends such as sustainable development can benefit from measuring the effects of change programs through the proposed instrument.

**References**

Anderson, L. & Krathwohl, D. (2001). *A Taxonomy for Learning, Teaching, and Assessing: a Revision of Bloom's Taxonomy of Educational Objectives.* New York: Longman.

Audigier, F. (2000). Project *"Education for democratic citizenship: basic concepts and core competencies for education for democratic citizenship".* Strasbourg: Council of Europe.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1-26.

Berglund, T., & Gericke, N. (2018). Exploring the role of the economy in young adults' understanding of sustainable development. *Sustainability, 10*(8), 1–17. doi: 10.3390/su1008

Berglund, C., Gericke, N., & Rundgren, S. (2014). The implementation of education for sustainable development in Sweden: investigating the sustainability consciousness among upper secondary students. *Research in Science & Technological Education, 32*(3), 318-339.

Boeve-de Pauw, J., Gericke, N., Olsson, D., & Berglund, T. (2015). The effectiveness of education for sustainable development. *Sustainability, 7*(11), 15693–15717. doi: 10.3390/su71115693

Bonazzi Piasentin, F., & Roberts, L. (2018). What elements in a sustainability course contribute to paradigm change and action competence? A study at Lincoln University. *Environmental Education Research, 24*(5), 694–715. doi: 10.1080/13504622.2017.1321735

Braun, V., & Clarke, V. (2006). Using thematic analysis in Psychology. *Qualitative Research in Psychology, 45*(12), 662-673.

Breiting, S., Hedegaard, K., Mogensen, F., Nielsen, K., & Schnack, K. (2009). *Action competence, conflicting interests and environmental education – the MUVIN programme.* Research Programme for Environmental and Health Education, DPU (Danish School of Education).

Breiting, S. & Mogensen, F. (1999). Action Competence and Environmental Education. *Cambridge Journal of Education, 29*(3), 349-353.

Brown, T. A. (2015). *Methodology in the social sciences. Confirmatory factor analysis for applied research (2nd ed.).* The Guilford Press.

Chawla, L. (2009). Growing up green: Becoming an agent of care for the natural world. *The Journal of Developmental Processes, 41*(1), 6-23.

Chawla, L., & Flanders Cushing, D. (2007). Education for strategic environmental behavior. *Environmental Education Research, 13*(4), 437–452. doi: 10.1080/13504620701581539

Cincera, J., & Krajhanzl, J. (2013). Eco-Schools: what factors influence pupils' action competence for pro-environmental behaviour? *Journal of Cleaner Production, 61*, 117–121. doi: 10.1016/j.jclepro.2013.06.030

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education, seventh edition.* London and New York: Routledge.

DeVellis, R.F. (2017). *Scale development: theory and application.* Applied Social Research Methods Series, 26, 4th ed. Thousand Oaks, London, New Delhi: Sage Publications.

Eames, C., Cowie, B., & Bolstad, R. (2008). An evaluation of characteristics of environmental education practice in New Zealand schools. *Environmental Education Research, 14*(1), 35-51. doi: 10.1080/13504620701843343

Ellis, G., & Weekes, T. (2008). Making sustainability 'real': Using group-enquiry to promote
education for sustainable development. *Environmental Education Research, 14*(4), 482–
500. doi: 10.1080/13504620802308287

Furr, R.M. (2011). *Scale Construction and Psychometrics for Social and Personality
Psychology.* London, New Oakes, New Delhi, Singapore: Sage Publications.

Gkargkavouzi, A., Halkos, G., & Matsiori, S. (2019). Development and validation of a scale
for measuring Multiple Motives toward Environmental Protection (MEPS). *Global
Environmental Change, 58*. doi : 10.1016/j.gloenvcha.2019.101971

Hadjichambis, A.C., Reis, P., Paraskeva-Hadjichambi, D., Činčera, J., Boeve-de Pauw, J.,
Gericke, N., & Knippels, M.C. (2020). *Conceptualizing Environmental Citizenship for
21st Century Education* (69-82). Cham, Switzerland: Springer International Publishing.
doi: 10.1007/978-3-030-20249-1

Henseler, J., Ringle, C.M., & Sarstedt, M. (2015). A new criterion for assessing discriminant
validity in variance-based structural equation modeling. *Journal of the Academy of
Marketing Science 43*, 115–135. doi: 10.1007/s11747-014-0403-8

Howell, R.A. (2013). It's not (just) ''the environment, stupid!'' Values, motivations, and
routes to engagement of people adopting lower-carbon lifestyles. *Global Environmental
Change, 23,* 281-290. doi: 10.1016/j.gloenvcha.2012.10.015

Hungerford, H.R., & Volk, T.L. (1990). Changing learner behavior through environmental
education. *The Journal of Environmental Education, 21*(3), pp. 8–21.

Jensen, B.B. (2000). Health knowledge and health education in the democratic health-
promoting school. *Health Education, 100*(4), 146-154. doi:
10.1108/09654280010330900

Jensen, B.B., & Schnack, K. (2006). The action competence approach in environmental education. *Environmental Education Research, 12*(3-4), 471-486. doi: 10.1080/13504620600943053

Jickling, B. & Wals, A.E.J. (2008). Globalization and environmental education: looking beyond sustainable development. *Journal of Curriculum Studies, 40*(1), 1-21.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33*(1), 159–174.

Mîndrilă,, D. (2010). Maximum Likelihood (ML) and Diagonally Weighted Least Squares (DWLS) Estimation Procedures: A comparison of estimation bias with ordinal and multivariate non-normal data. *International Journal of Digital Society 1*(1), 60-66.

Moeller, J., & Grassinger, R. (2013). *A review of passion concepts and their overlaps with commitment: Opening a can of worms.* (Doctoral dissertation). Retrieved from http://www.db-thueringen.de/servlets/DerivateServlet/Derivate-29036/DissJuliaMoeller.pdf

Mogensen, F., & Schnack, K. (2010). The action competence approach and the 'new' discourses of education for sustainable development, competence and quality criteria. *Environmental Education Research, 16*(1), 59-74. doi: 10.1080/13504620903504032

Olsson, D., Gericke, N., Sass, W., & Boeve-de Pauw, J. (2020). Self-perceived action competence for sustainability: the theoretical grounding and empirical validation of a novel research instrument. *Environmental Education Research, 26*(5), 742-760. doi: 10.1080/13504622.2020.1736991

Pelletier, L.G.; Tuson, K.M.; Green-Demers, I.; Noels, K.; & Beaton, A.M. (1998). Why are you doing things for the environment? The motivation toward the environment scale. *Journal of Applied Social Psychology 28*(5), 437–468.

Sass, W., Boeve-de Pauw, J., Olsson, D., Gericke, N., De Maeyer, S., & Van Petegem, P. (2020a). Redefining action competence: The case of sustainable development. *The Journal of Environmental Education.* doi: 10.1080/00958964.2020.1765132

Sass, W., Quintelier, A., Boeve-de Pauw,J., De Maeyer,S., Gericke, N., & Van Petegem, P. (2020b): Actions for sustainable development through young students' eyes. *Environmental Education Research.* doi: 10.1080/13504622.2020.1842331

Scott, J. (2008). Children as respondents. In P. Christiansen & A. James (Eds.), *Research with Children: Perspectives and Practices* (87-108). New York and London: Routledge.

Smederevac-Lalic, M., Finger, D., Kovách, I., Lenhardt, M., Petrovic, J., Djikanovic, V., Conti, D., & Boeve-de Pauw, J. (2020). Chapter 5: Knowledge and Environmental Citizenship. In A.C. Hadjichambis, P. Reis, D. Paraskeva-Hadjichambi, J. Činčera, J. Boeve-de Pauw, N. Gericke, & M.C. Knippels (Eds.), *Conceptualizing Environmental Citizenship for 21ˢᵗ Century Education* (69-82). Cham, Switzerland: Springer International Publishing. doi: 10.1007/978-3-030-20249-1

Smetana, J. G., Campione-Barr, N., & Metzger, A. (2006). Adolescent development in interpersonal and societal contexts. *Annual Review of Psychology, 57,* 255-284.

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

Torkar, G. & Bogner, F.X. (2019). Environmental values and environmental concern. *Environmental Education Research, 25*(10), 1570-1581. doi: 10.1080/13504622.2019.1649367

United Nations (2015). *Transforming our world: the 2030 Agenda for Sustainable Development.* New York: United Nations.

Vallerand, R.J. (2015). *The psychology of passion. A dualistic model.* Oxford: Oxford University Press.

Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences, 34*, 783–794.

**Addendum**

**Table A1** Overview of SD issues aimed at per action (implicitly mentioned aspects between brackets)

| Action | Planet | People | Prosperity | Peace | Partnership |
|---|---|---|---|---|---|
| Donating clothes to the needy (living in poverty or having fled war) | | X | | | |
| Helping homeless find shelter | | X | | | |
| Organizing activities for promoting gender equality | | X | | | |
| Using eco-friendly transport, saving resources, reducing CO2 emission | X | | | | |
| Buying fair trade products | | X | | | |
| Boycotting products tested on animals | X | | | | |
| Starting, supporting and/or cooperating with aid organizations | | X | | | X |
| Raising/collecting, and donating funds, equipment (e.g. boats), food, or clothes to the needy | | X | (X) | X | |

| | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Asking authorities and nations for help or support | | | | | X |
| Raising and donating funds, food, or clothes to aid organizations | | X | | | (X) |
| Creating opportunities for education, earning a life, and housing | | X | X | | |
| Organizing a school event to inform/educate the public about how eco-friendly behavior can facilitate wellbeing, and a fairer world | X | X | | X | (X) |
| Suggesting law creation and enforcement for keeping the environment clean (e.g. plastic free) | X | | | | |
| Calling on nations for keeping peace | | X | X | X | |
| Speaking up against intolerance, bullying, and war | | X | X | X | |
| Promoting gender equality on the Internet (e.g. YouTube, Instagram,…) or offline (involving friends, neighbors,…) | | X | | | (X) |
| Putting a message for peace on social media | | | | X | |
| Calling for a boycott of products tested on animals | X | | | | |
| Promoting eco-friendly behavior (transport, heating, lighting, reducing CO2 emission, waste, and littering) | X | | | | (X) |
| Collecting litter from streets (also to prevent sea pollution) | X | | | | |
| Informing acquaintances or the general public about aid organizations | | X | | | (X) |
| Calling for action against poverty | | X | X | | |
| Pay it forward (doing something good for three other people, who in turn do something good for three others.) | | X | | X | X |

**Table A2** Descriptives and reliability of the action competence in sustainable development questionnaire and subconstructs (ACiSD-Q; study 3; English translations by first author)

| ACiSD subconstruct<br><br>$n = 1796$ | Cronbach's $\alpha$<br><br>(0.92 for ACiSD) | item | means | SD |
|---|---|---|---|---|
| Conceptual Knowledge | **0.74** | | | |
| People contribute to a good life for everyone without damaging the planet if they… | | | 4.1 | 0.56 |
| Conceptual Knowledge Planet | … save electricity and water at home | K4 | 4.2 | 0.90 |
| | … collect litter from the streets with friends. | K9 | 4.0 | 1.08 |
| | … only use toiletries from brands that don't experiment on animals. | K10 | 3.7 | 1.16 |
| Conceptual Knowledge People | … give clothes they don't use any more to people that live in poverty here with us. | K6 | 4.4 | 0.88 |
| | … organize a jumble sales and donate the profit to a charity. | K8 | 4.1 | 1.01 |
| | … treat boys and girls as equal. | K11 | 4.5 | 0.81 |
| Conceptual Knowledge Peace | … use social media (such as YouTube) to convey a message for peace. | K1 | 3.4 | 0.98 |
| | … develop an action against bullying at school. | K2 | 4.3 | 0.87 |
| | … give clothes they don't use any more to people who have fled from war. | K7 | 4.1 | 1.03 |
| Willingness | **0.77** | | | |
| I want to… | | | 3.9 | 0.64 |
| Willingness Planet | … save electricity and water at home | W4 | 4.2 | 0.93 |
| | … collect litter from the streets with friends. | W9 | 3.7 | 1.21 |
| | … only use toiletries from brands that don't experiment on animals. | W10 | 3.6 | 1.25 |
| Willingness People | … give clothes they don't use any more to people that live in poverty here with us. | W6 | 4.2 | 1.02 |

| | | | | |
|---|---|---|---|---|
| | … organize a jumble sales and donate the profit to a charity. | W8 | 3.8 | 1.13 |
| | … treat boys and girls as equal. | W11 | 4.5 | 0.81 |
| Willingness Peace | … use social media (such as YouTube) to convey a message for peace. | W1 | 3.3 | 1.10 |
| | … develop an action against bullying at school. | W2 | 4.1 | 1.00 |
| | … give clothes they don't use any more to people who have fled from war. | W7 | 4.0 | 1.10 |
| Capacity Expectations<br><br>I can… | **0.73** | | 3.8 | 0.63 |
| Capacity Expectations Planet | … save electricity and water at home | CE4 | 4.2 | 0.98 |
| | … collect litter from the streets with friends. | CE9 | 3.9 | 1.19 |
| | … only use toiletries from brands that don't experiment on animals. | CE10 | 3.5 | 1.23 |
| Capacity Expectations People | … give clothes they don't use any more to people that live in poverty here with us. | CE6 | 4.1 | 1.08 |
| | … organize a jumble sales and donate the profit to a charity. | CE8 | 3.5 | 1.20 |
| | … treat boys and girls as equal. | CE11 | 4.4 | 0.92 |
| Capacity Expectations Peace | … use social media (such as YouTube) to convey a message for peace. | CE1 | 3.4 | 1.17 |
| | … develop an action against bullying at school. | CE2 | 3.8 | 1.05 |
| | … give clothes they don't use any more to people who have fled from war. | CE7 | 3.8 | 1.19 |
| Outcome Expectancy<br><br>I contribute to a good life for everyone without damaging the planet if I… | **0.79** | | 3.9 | 0.66 |
| Outcome Expectancy Planet | … save electricity and water at home | OE4 | 4.3 | 0.91 |
| | … collect litter from the streets with friends. | OE9 | 3.9 | 1.16 |

| | | | | |
|---|---|---|---|---|
| | … only use toiletries from brands that don't experiment on animals. | OE10 | 3.6 | 1.19 |
| Outcome Expectancy People | … give clothes they don't use any more to people that live in poverty here with us. | OE6 | 4.1 | 1.06 |
| | … organize a jumble sales and donate the profit to a charity. | OE8 | 3.8 | 1.14 |
| | … treat boys and girls as equal. | OE11 | 4.4 | 0.94 |
| Outcome Expectancy Peace | … use social media (such as YouTube) to convey a message for peace. | OE1 | 3.3 | 1.12 |
| | … develop an action against bullying at school. | OE2 | 4.0 | 1.03 |
| | … give clothes they don't use any more to people who have fled from war. | OE7 | 3.9 | 1.15 |
| Self-efficacy | **0.86** | | 3.9 | 0.59 |