Prepared to Act for a Sustainable Future?

Early adolescents' action competence as a learning outcome of education for sustainable development

–

Klaar om te gaan voor een duurzame toekomst?

De actiecompetentie van jong-adolescenten als leeruitkomst van educatie voor duurzame ontwikkeling

Wanda Sass

Disclaimer

Printing: Proefschriftmaken.nl
Cover design: Oetang learning designers, Wanda Sass, Nina Vanhout & Juliette Vink
Photo by Wanda Sass
Drawing by Nina Vanhout & Juliette Vink
SDG pictograms retrieved from www.un.org

The studies in this dissertation were part of the VALIES project and funded by the Flanders Research Foundation (FWO) under grant agreement S010317N within the Strategic Basic Research program.

Faculty of Social Sciences
Department of Training and Education Sciences

Prepared to Act for a Sustainable Future? Early adolescents' action competence as a learning outcome of education for sustainable development

Klaar om te gaan voor een duurzame toekomst? De actiecompetentie van jong-adolescenten als leeruitkomst van educatie voor duurzame ontwikkeling

Dissertation to obtain the degree of doctor in Educational Sciences at the University of Antwerp

Wanda Sass
Antwerp, 2022

Supervisors:
Prof. dr. Jelle Boeve-de Pauw
Prof. dr. Sven De Maeyer

Composition of the doctoral jury

Supervisors

Prof. dr. Jelle Boeve-de Pauw, University of Antwerp, Belgium and Utrecht University, The Netherlands

Prof. dr. Sven De Maeyer, University of Antwerp, Belgium

Doctoral Committee

Prof. dr. Jan Vanhoof (chair), University of Antwerp, Belgium

Prof. dr. Peter Van Petegem, University of Antwerp, Belgium and the Norwegian University of Science and Technology in Trondheim (NTNU), Norway

Prof. dr. Niklas Gericke, Karlstad University, Sweden

Doctoral jury

Prof. dr. Per Sund, Stockholm University, Sweden

Dr. Maria Magdalena Isac, Catholic University of Leuven, Belgium and Italian Institute for the Evaluation of the Education System (INVALSI), Italy

Sustainable Development

Due to the rapidly increasing world population
dwindling natural resources
rapidly polluted nature:
of the soil
of water
of the air
of the forests
green areas
of water basins
of the seas
of the lakes
of the rivers
of the rivers'
animals
preserving the existence and health
aimed at development.

Elifnaz Türeyen
(15, Turkish Youth Environmental Education Congress ambassador)

Thank you! Hartelijk dank!

De voorbije vijf jaar ging ik blij op pad om onderzoek te doen naar de actiecompetentie van jongeren als leeruitkomst van educatie voor duurzame ontwikkeling. Het was een boeiende reis en ik ben nu een gigantische VALIES bomvol fijne ervaringen rijker. Het is een verhaal geworden over leraars en leerlingen en er waren heel wat momenten van herkenning: ook ikzelf mocht heel wat leren van mijn leraars en leerlingen. Dit is dan ook een uitgelezen ogenblik om jullie allemaal te bedanken voor jullie bijdrage aan wie ik tot nu toe geworden ben. Jullie waren met zovelen. Ik kan onmogelijk iedereen met naam en toenaam vermelden, maar weet je vertegenwoordigd door wie hier wél persoonlijk vernoemd worden.

Let me start with some warm words of appreciation for the members of the jury. Per, your enthusiasm for the redefinition of the action competence concept provided extra energy and fed my hope that respect for the original researchers' views would come across in the studies presented here and at conferences. Magda, you believed in my (methodological) research skills and were a great antidote for the little devil of doubt that came teasing at times. You were also living proof of the bridge between citizenship and sustainability education. Niklas, you were the first to get involved, being a member of the doctoral committee from the very start. Your focus on the connection between action competence and (good) education contributed highly to the direction this PhD eventually took. You also taught me about the different voices that should be heard in a manuscript: that of the literature, the data, and the author(s). Per, Magda, and Niklas: thank you so much!

En dan zijn er de Edubron-juryleden. Peter, jij was van bij de aanvang erg betrokken bij dit doctoraat rond actiecompetentie. Je verwachtingen leken hoog gespannen en dat maakte het best wel spannend. Ik wilde je niet teleurstellen en was dan ook blij dat je geregeld feedback gaf op je eigen constructief kritische, maar ook geruststellende manier. Je waarderende woorden gaven me moed. Jan, ook jij toonde van bij het begin interesse in deze onderzoekslijn en het stond dan ook in de sterren geschreven dat je de voorzitter van deze jury zou worden. Je zorgde voor een frisse kijk op het werk dat geleverd was en zag een link met het schoolniveau, wat zorgde voor een mooie samenhang van verschillende onderzoekslijnen binnen het VALIES-project.

'Mijn' promotoren: Jelle en Sven, jullie waren dé ideale tandem. Allebei even persoonlijk bevlogen als het gaat om duurzaamheid en toch net verschillend genoeg om alle voeding te geven die het beestje 'investigator actiecompentensis' nodig had om te groeien en te bloeien. Jullie engagement en passie versterkten mijn vertrouwen in eigen kunnen en in de resultaten van dit doctoraatsproject. Daarenboven waren jullie bijzonder genereus in het delen van jullie kennis en algehele expertise. Sven, jouw blijken van vertrouwen in mijn kijk

op data, de analyse en interpretatie daarvan, bleken het perfecte vaccin telkens als het impostor-virus dreigde toe te slaan. Je stuurde bij waar nodig en liet me mijn gang gaan waar het kon. Je was een rots in de branding. Jelle, ook zonder jouw methodologische en rijke inhoudelijke inzichten was dit onderzoek nooit geworden wat het nu is. Via diverse kanalen voorzag je me van interessante artikels (al dan niet al gepubliceerd), contacten binnen de onderzoekswereld en in het bredere veld met focus op (educatie voor) duurzame ontwikkeling. En dat VALIES-project van jou, daar was ik meteen voor verkocht. Jouw zorgzaamheid als het erom ging onderzoek dicht bij de praktijk te houden en te brengen maakten heel dit avontuur des te relevanter en boeiender. Jelle en Sven, jullie vormden een warm (onderzoeks)nest en ook de meer persoonlijke babbeltjes tussendoor had ik voor geen geld willen missen. In mijn persoonlijke droomwereld komen we elkaar snel opnieuw tegen in een gezamenlijk onderzoeksproject. Aan jullie allen een heel hartelijk 'dankjewel' voor alle kansen die jullie me gaven.

Collega's, eerst in de Meerminne, dan in de Gratiekapelstraat en ten slotte in de Z-blok, samen met jullie werd er (soms) gebaald en (vaak) gelachen en gevierd. De kleine smarten en succesjes werden gedeeld en de Secret Santa's, kerstfeestjes, teamdagen en FSW doctorandidagen waren telkens hoogtepunten om naar uit te kijken. Wie me voorafging, gaf me een inkijkje in wat nog zou komen. Wie samen met me aan de start stond, deelde de ups en downs all the way. For the colleagues who joined Edubron more recently, I hope to (have) contribute(d) to a similar atmosphere of support and appreciation. You all rock!
Also the colleagues I was fortunate to find on my path at Summer Schools and conferences made me feel welcome in the broader research community. Quite a few of you have meanwhile become friends I absolutely appreciate and want to keep close to my heart. A special group of Belgian and international friends are the young activists I got to know through research activities and at conferences such as WEEC/YEEC. You brought this dissertation's research alive. I really hope you will recognise the insights and stories you shared with me so generously. Thank you all for being your lovely selves.

VALIES-collega's, jullie kwamen… en gingen… en kwamen (soms) weer terug. Elk van jullie maakte VALIES tot de schitterende ervaring die het die vijf jaar geweest is. Onderzoekers, pedagogisch begeleiders, lerarenopleiders, deelnemende schoolteams, leraars en leerlingen, jullie waren de parels aan de kroon. Het was een feest om met jullie te mogen (mee)werken. Ik hoop jullie nog vaak op mijn pad te vinden.

Een ietwat langere voorgeschiedenis betekent dat leraars en leerlingen uit een wat verder verleden net zo goed bijgedragen hebben tot mijn groei als mens, leraar en onderzoeker. Om te beginnen waren er de leraars die veel meer deden dan kennis overdragen en vaardigheden ontwikkelen. Willy, 'mijne meester van viool', Rich, 'mijne meester van het vierde leerjaar', Liliane, 'mijn juffrouw van het vijfde leerjaar' of 'moeke Lili', Roger, de eerste die me bewust maakte van de schoonheid van wiskunde en structuren,… jullie zijn voorbeelden van hoe leraars in mijn ogen het verschil kunnen maken. Zonder jullie had hier

wellicht een compleet ander mens gestaan. Willy, Serge en Carlo, van jullie leerde ik de constructieve waarde van harmonie, maar ook van welgemikte dissonantie en van timing begrijpen. Jullie leerden me te luisteren naar mijn eigen lied en dat van anderen. In jullie ensembles kreeg ik de kans om te functioneren in een groter geheel. Kortom, 'mijn' leraars, ik hoop van harte dat ik een beetje jullie invulling van het leraar zijn heb kunnen voortzetten tijdens en voor ik aan dit onderzoeksproject begon.

En zo komen we bij 'mijn' (oud)leerlingen. Jullie weten niet half hoeveel ik van jullie heb geleerd. Alle boeken pedagogie en didactiek kunnen daar niet aan tippen. Jullie zijn het levende bewijs dat jongere generaties aan ons, 'boomers', echt wel het één en ander te vertellen hebben dat het beluisteren meer dan waard is. Jullie vlogen uit en sommigen van jullie kwamen iets later opnieuw langs, al dan niet als collega. Ik ben supertrots op jullie allemaal en ben blij dat we ook dit moment samen kunnen vieren.

Ten slotte is er de familie: Tanty, die bleef volgen welke studie nu weer begonnen, in de steigers, ingediend, ge-desk-reject of gepubliceerd was tijdens onze dagelijkse telefoontjes; zussen en co., die wel eens wilden weten waar dat doctoraat nu eigenlijk over ging.

En last but most certainly not least: Jo en Freija, de schatten van mijn leven. Jo, je zag me telkens met lede ogen naar een congres vertrekken, maar dat belette je niet om je binnen de kortste keren te ontpoppen tot de exclusieve VALIES-taxi van dienst. Jij was degene die me leerde oog hebben voor het esthetische. Je kijk op lay-out en visuele harmonie kwam goed van pas bij de vormgeving van dit boek. En ook die stoere mok onovertrefbare pompoensoep die vaak plots op mijn bureau stond, heb ik bijzonder gewaardeerd. Freija, jij liet me voor het eerst kennis maken met het begrip duurzaamheid en stond daardoor mee aan de wieg van dit project. Bedankt dat je me mee liet profiteren van je inzichten als ('niet dat soort') bioloog, wetenschapscommunicator en milieuwetenschapper. Je steunde me door dik en dun en ik geniet nóg van onze gezamenlijke slappe-lachbuien, filosofische en andere wandelingen en victoriedansjes. Laten we dat vooral blijven doen.

Aan jullie allen: Dikke merci! To you all: thank you so very much!

Samenvatting

De staat waarin de planeet zich momenteel bevindt en de gevolgen daarvan voor natuur en mens, hebben bij velen het gevoel gevoed dat actie dringend nodig is. Actie is dan ook een belangrijk punt geworden op de agenda van beleidsmakers, onderzoekers en (jonge) burgers. Allen zijn wel eens overweldigd geweest door de omvang van de taak die ze zich stelden. Ze vroegen zich daarbij af welke competenties nodig zijn om die enorme uitdaging aan te gaan en hoe de nodige competenties kunnen ontwikkeld en onderwezen worden. Zowel in onderzoeks- als beleidsmiddens wordt nadrukkelijk gewezen op het belang van duurzame ontwikkeling als we aanvaardbare levensomstandigheden willen waarborgen voor huidige en toekomstige generaties. Beleidsaanbevelingen bouwen veelal voort op de 17 Duurzame Ontwikkelingsdoelen zoals die door de Verenigde Naties beschreven werden in 2015. Doel daarvan is om te evolueren naar een duurzame ontwikkeling, gedefinieerd als een proces van elkaar wederzijds beïnvloedende milieu-, sociale, en socio-economische perspectieven. Onder onderzoekers en beleidmakers is eensgezindheid over de nood aan inspanningen in het onderwijs indien we willen gaan voor duurzame(re) keuzes die de uitdagingen het hoofd kunnen bieden.

Educatie voor duurzame ontwikkeling (EDO) wordt gezien als een belangrijk instrument om huidige en toekomstige duurzaamheidskwesties aan te pakken. Deze onderwijsbenadering wordt geacht in staat te zijn om de nodige competenties te helpen ontwikkelen bij leerlingen, zodat ze actie kunnen ondernemen voor duurzame ontwikkeling. EDO wordt gekenmerkt door een holistische, pluralistische en actiegerichte onderwijsaanpak. De schaarse studies over de effectiviteit van EDO om de actiecompetentie van leerlingen te (helpen) ontwikkelen, onderzochten de effecten van holisme en pluralisme. De resultaten die in de literatuur beschreven werden, suggereerden dat holisme de kennis betreffende SD en actiemogelijkheden verhoogt. Pluralisme zou dan een positieve invloed hebben op de wil (goesting) om actie te ondernemen, het vertrouwen in eigen kunnen en in de impact van eigen gedrag. Toch was het concept actiecompetentie nog redelijk onscherp bij aanvang van dit doctoraat, ondanks de rijke beschrijvingen die in de literatuur te vinden waren sinds onderzoekers aan de Deense School of Education het concept ontwikkelden in de jaren tachtig. Zij zagen actiecompetentie als een onderwijskundig ideaal dat leerlingen zou ondersteunen in hun voortdurende ontwikkeling tot burgers die in staat zijn om actie te ondernemen. Toch was het ook deze verwevenheid van een onderwijsaanpak met zijn verhoopte leeruitkomsten die verwarring zaaide. Want uit die tweeledigheid ontstonden twee verschillende interpretaties van het concept actiecompetentie in de literatuur. In de ene studie werd actiecompetentie beschouwd als een onderwijsaanpak, terwijl andere onderzoekers het zagen als een leeruitkomst van een onderwijsaanpak zoals democratische gezondheids- en milieueducatie of EDO.

Bovendien werd gesteld dat een meting van dergelijke leeruitkomsten cruciaal was om EDO-implementatieïnspanningen te kunnen monitoren. Ondanks de rijke onderzoekstraditie naar leeruitkomsten in vakken zoals wiskunde, wetenschappen en (moeder)taal, ontbreekt het tot op heden aan effectiviteitsonderzoek naar actiecompetentie als leeruitkomst van EDO of zijn dergelijke studies op zijn minst toch schaars te noemen.

De vijf studies in deze dissertatie willen bijdragen aan het voortschrijdende inzicht in wat actiecompetentie nu precies is en of een bepaalde onderwijsaanpak beloftevol kan zijn om jong adolescenten te ondersteunen in hun ontwikkeling tot actiecompetente burgers. Wat betreft de methodologie vertrokken we daarbij vanuit een pragmatisch standpunt, waarbij de onderzoeksdoelen de opeenvolging van de studies leidde. In een exploratief sequentieel multi-method design vertrokken we van twee kwalitatieve studies die de basis vormden voor de daarop volgende kwantitatieve studies. Dit onderzoeksdesign wordt aanbevolen om reële complexe fenomenen, zoals actiecompetentie en duurzame ontwikkeling, te bestuderen in sociale en onderwijscontexten. De eerste studie ging van start met een herdefiniëring van actiecompetentie als een generieke competentie van (groepen) mensen. Het concept werd vervolgens gespecifieerd in de context van duurzame ontwikkeling als actiecompetentie in duurzame ontwikkeling ('action competence in sustainable development' of kortweg 'ACiSD'). ACiSD bestaat uit de relevante kennis, de wil ('goesting') en zelfeffectiviteit die nodig zijn om te kunnen bijdragen aan een duurzame ontwikkeling. In de tweede studie gaven we jong-adolescenten een stem zodat ze ons konden leren welke duurzaamheidsacties ze het dringendste vonden en toch ook uitvoerbaar achtten door iemand van hun leeftijd. Op basis van de bevindingen uit de eerste twee kwalitatieve studies werd ACiSD geoperationaliseerd en ontwikkelden we een betrouwbaar en valide vragenlijst, de ACiSD-Q, die toeliet om bepaalde aspecten van het concept te meten (studie 3). De laatste twee kwantitatieve studies bevestigden het belang van het klasgebeuren (studie 4) en leverden evidentie voor de waarde van een op actie gerichte EDO-aanpak voor de ontwikkeling van actiecompetentie in duurzame ontwikkeling bij jong-adolescenten (studie 5).

Deze dissertatie groeide toe naar een begrip van actiecompetentie als een competentie van (groepen) mensen die willen bijdragen aan de opbouw van een duurzame wereld voor huidige en toekomstige generaties zonder dat de planeet daardoor uitgeput wordt. De eerste stappen zijn gezet. We ontrafelden de verschillende interpretaties van het begrip actiecompetentie, maakten het meetbaar en vonden empirische bevestiging voor theoretische aannames over de effectiviteit van EDO voor de ontwikkeling van actiecompetentie inzake duurzame ontwikkeling van jong-adolescenten. De conclusie van dit doctoraatsonderzoek is dan ook dat een democratische onderwijsaanpak, zoals actiegerichte educatie voor duurzame ontwikkeling, de actiecompetentie van leerlingen kan helpen ontluiken, zodat ze beter gewapend zijn om actief hun steentje bij te dragen aan inspanningen die nodig zijn om toekomstige duurzaamheidsuitdagingen aan te pakken.

Summary

In light of the current state of the planet and its subsequent effects on nature and people, a sense of urgency for taking action is felt by many. The topic of action-taking has been on the agendas of policy makers, researchers, and (young) citizens alike. All have at one point or another been overwhelmed by the formidable task they set themselves, wondering what competences are required for taking on the challenge, and how these can be developed and taught. Along with the research community, also international policy makers keep underscoring the importance of sustainable development in order to secure acceptable living conditions for current and future generations. Policy recommendations largely build onto the 17 Sustainable Development Goals that were described by the United Nations in 2015. They aim at working towards sustainable development, which was defined as a process of mutually interacting environmental, social, and socio-economic perspectives. Both the scholarly and policy communities agree that educational efforts at all levels are paramount if we are to promote sustainable lifestyles that would allow to take on the challenges involved.

Education for sustainable development (ESD) has been put forward as an important tool for tackling current and future sustainability issues. With its components of holism, pluralism, and an orientation towards action, this educational approach is believed to foster students' competence in taking action for sustainable development. The scarce studies on ESD effectiveness for fostering action competence within students, looked into the effects of holism and pluralism. Results described in the literature suggested that holism may support students' knowledgeability about actions for sustainable development, while a pluralistic approach appeared to enhance their willingness to act and confidence in their capacities to perform SD actions, and in the impact of their behaviour. However, at the onset of the doctoral research presented in this dissertation, the concept of action competence was still fuzzy, regardless of the rich definitions that were available in the literature since researchers at the Danish school of Education had first coined the term in the eighties. Its richness lay in its view of action competence as an educational ideal that would support students' ongoing development of the competences needed for taking action. Still, the entanglement of this educational approach with its dreamed-of learning outcomes, also caused confusion. Two different interpretations of the concept of action competence were present in the literature. Some studies treated action competence as an educational approach, while others viewed it as a learning outcome of educational approaches such as democratic health and environmental education, or education for sustainable development.

Moreover, in order to monitor efforts made to implement ESD, measurement of learning outcomes was felt to be crucial. And yet, regardless of the rich history of research into

cognitive learning outcomes of subjects such as mathematics, science, and (native) language, effectiveness research relating to action competence as a learning outcome of education for sustainable development has been scarce if not missing to date.

The five studies presented in this dissertation aim to complement and add to the growing insight into what action competence is exactly, and whether certain educational approaches are promising for facilitating early adolescents' action competence development. From a methodological perspective, we took a pragmatic stance in which the research aims and questions guided the flow of the five studies. Therefore, we adopted an exploratory sequential multi-method design, which is recommended for investigating complex real world issues, such as action competence and sustainable development, in social and educational contexts. The first study started with redefining action competence as a generic competence of (groups) of people. The concept was then exemplified in the context of sustainable development as action competence in sustainable development (ACiSD), which consists of the relevant knowledge and skills, willingness, and self-efficacy needed to contribute to sustainable development. Secondly, early adolescents were given a voice so they could teach us what actions for sustainable development they thought most urgent and at the same time feasible for someone their age. Based on the findings in the first two qualitative studies, we operationalised ACiSD and developed a valid and reliable questionnaire instrument (the ACiSD-Q) that allowed to measure certain features of ACiSD (study 3). The last two quantitative studies established the importance of the classroom level (study 4) and provided evidence for the merits of action-oriented ESD for early adolescents' ACiSD development (study 5).

This dissertation further developed the growing insight into action competence as a competence of (groups of) people who want to contribute to building a sustainable world for current and future generations without exhausting the planet. The first steps have been taken. We disentangled the different interpretations regarding the concept of action competence, made it measurable, and found empirical evidence for theoretic assumptions concerning the effectiveness of ESD for early adolescents' ACiSD development. Consequently, the conclusion of this doctoral research is that democratic approaches to teaching, such as action-oriented education for sustainable development, can foster students' action competence, and equip them for taking an active part in efforts needed to face future sustainability challenges.

Content

List of figures

List of tables

Chapter 1

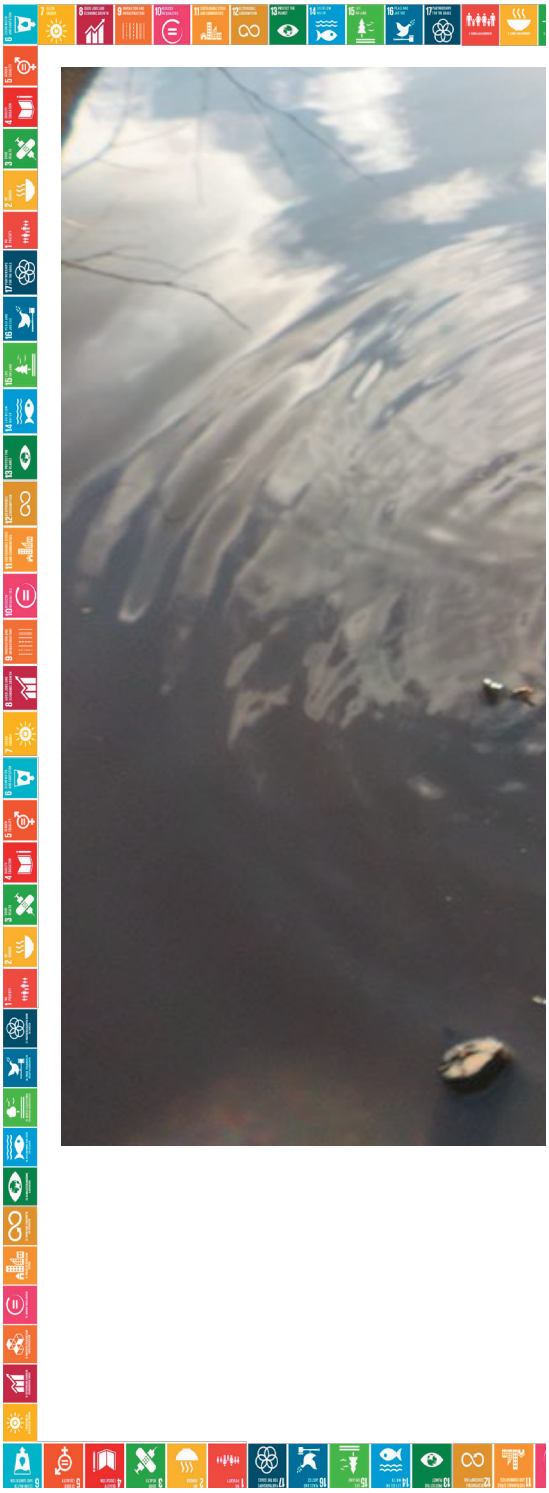
Introduction

Chapter 1

So let the journey commence…

In light of the current state of the planet and its subsequent effects on nature and people, a sense of urgency for taking action is felt by many. The topic of action-taking has been on the agendas of researchers, policy makers, and (young) citizens alike. All have at one point or another been overwhelmed by the formidable task they set themselves, wondering what competences are required for taking on the challenge and how these can be developed and taught. The studies presented here aim to add to the growing insight into what competences are needed and whether certain educational approaches are promising for facilitating early adolescents' action competence development. The current dissertation hopes to give early adolescents a voice and throw a pebble in the pond with its contribution to the research literature, so all willing can be prepared to act for a sustainable future for all.

This introduction describes the state of affairs at the onset of the current PhD research. We first look into the need for action and the concept of action competence. Secondly, education for sustainable development is introduced as a possible approach for fostering action competence. Thirdly, we sketch the context in which the research unfolded. Finally, we highlight those research gaps that led to the aims of this dissertation, along with the methodological design of the research and flow of the different studies.



Introduction

“One thing that I would like to see more of is more youth engagement, because at the end we are the ones that are gonna stay in this world. Our thoughts definitely have to be heard, have to be shared, because a lot has to be done, and at the end we are the future generations.”

Hoor Ahli (16, United Arab Emirates, at UN COP26, 2021)

The need for action and the concept of action competence

Importance of action and youth's voices for sustainable development

As early as 1977, policy makers expressed concern about the detrimental effects of human behaviour on the environment and thus on humanity itself (UNESCO, 1977). They were backed up by an unwavering and overwhelming consensus amongst scholars that human behaviour is at the origin of global phenomena such as climate change (Goot, 2011; Cook et al., 2016). Meanwhile, the sense of urgency for adopting more sustainable lifestyles is rising with every manifestation of these climatic changes, such as extreme weather conditions (United Nations, 2022). Partnership between nations and generations is called for in order to fight poverty, inequity, and environmental degradation (United Nations, 2015). This includes youth's meaningful participation and action taking, which international stakeholders are urged to ensure (United Nations, 2022). Action is a goal-oriented behaviour that drives the action taker by their own choice. Across the planet, young activists have proven to be willing and ready to take action for sustainability which includes a demand for firmer action from their political leaders (YOUNGO, 2021). Their enthusiastic presence at events such as the weekly school strikes for climate action (for coverage see e.g. The Guardian, 24 May 2019), the United Nation's Youth Conferences (e.g. United Nations, 2022), and the Youth Environmental Education Congress (World Environmental Education Congress, 2022) are but a few manifestations of the younger generations' forceful calls on adults, in particular politicians and professionals in education, for promoting and facilitating more sustainable lifestyle choices. Allowing early adolescents to take part in democratic decision-making enhances their democratic (action) competences and prepares them for continued active participation as citizens in later life (Levy & Zint, 2013). Moreover, taking such collective action may enhance their belief in the impact of their individual and collective actions (Chawla & Cushing, 2007). Finally, it is during early adolescence (i.e. age brackets ten to fourteen) that civic engagement at a later age starts to develop, when role models are found gradually more within peers than parents (Chawla, 1999; Smetana, Campione-Barr, & Metzger 2006). Whereas previous generations of early adolescents found it hard to be taken into account and get heard (Chawla, Bartlett, Driskell, Hart, & Olofsson, 2006), they have recently proven to be a population and force to be reckoned with.

What is (the problem with) the concept of action competence?

Action competence (AC) was first coined as a label for the desired learning outcome of a democratic and holistic environmental and health education pedagogy in the Denmark of the early nineties (Jensen, 1997; Jensen & Schnack, 1993; Breiting & Mogensen 1999). In those writings, environmental and health education were set apart from nature studies in that they were to teach students *for* rather than *about* the environment or healthy lifestyles, respectively. Moreover, knowledge changes with progressing insight based on more recent scientific findings. Therefore, it is constrained by an expiration date, when new

evidence contradicts or adapts previously established knowledge. Moreover, the Danish scholars who introduced the term 'action competence' put it forward as a reaction to what they thought to be an overly normative and moralistic approach to environmental and health education in which insights from science at a certain point in time dictated what should be the behaviour students were to adopt (Breiting & Mogensen 1999; Jensen, 1997). They suggested an alternative in which democratic and participative teaching would support students in be(com)ing action competent citizens who are capable of making their own decisions (Jensen, 1997). By referring to action competence as 'an educational approach' (Mogensen & Schnack, 2010; p. 60) the term was used to refer to an educational approach rather than a competence of people. However, the Danish authors of the concept also referred to it as a competence to be developed within students. Breiting and Mogensen (1999), for example, refer to "the pupils' action competence" (p. 350), which suggests it is a competence of people. As such, Breiting et al. (1999/2009; p. 44) described it as

> *"a lasting capability and desire to join in democratic processes concerning the conflict-ridden man-nature relationship as critical agents".*

Both readings of 'action competence' have led to two different strands of research since the nineties. Some scholars have further developed and studied it as an educational approach (e.g. Ellis & Weekes, 2008), while others have interpreted and researched it as a competence of people (e.g. Cincera & Krajhanzl, 2013).

Furthermore, the original AC advocates' emphasis on the educational approach that was thought to foster AC sparked a discussion on whether and how science education would have a legitimate place in the action competence approach. Bishop & Scott (1998) strongly argued in favour of giving science education a place in action-competence pedagogy, provided science would be presented to pupils as tentative so they would develop an understanding of the nature of scientific scrutiny and the uncertainty surrounding its findings. This, they argued, could complement the aims of equipping students with the necessary knowledge and skills they need "to participate in decision-making processes around societal issues which have a scientific base" (Bishop & Scott, 1998; p. 234). Thus, they acknowledged the merits of a democratic (also called pluralistic) pedagogy, proposed in the action competence approach, as opposed to a more normative stance in which science dictates what exactly should be the right behaviour for solving environmental issues with a bearing on society.

In sum, two challenges remained unsolved at the onset of the work for the current PhD. Firstly, there was the question of whether the concept of action competence referred to a democratic educational approach or rather to a coherent combination of relevant knowledge, skills, and motivational aspects, i.e. a certain type of competence regarding action-taking. Secondly, there did not seem to be a consensus on whether action

competence development would be served best by a pedagogy with a predominant focus on democratic principles or by a more science-oriented educational approach. The former would aim to empower students for taking part in decision-making processes as committed citizens (e.g. Breiting & Mogensen, 1999), whereas the latter would additionally aim to foster scientific literacy within society (Bishop & Scott, 1998).

Starting from Breiting et al.'s (2009) definition of AC as a "capability and desire" (p. 44) to participate in democratic decision-making on how to solve sustainability issues, we will now dig deeper into both aspects of capability and desire. In this, the knowledge, skills, and motivational features of action competence should be seen as connected in a coherent whole (Jensen & Schnack, 1997/2006).

Capability: Knowledge and skills

Action competence is directed towards contributing to solutions for controversial issues such as the problematic human-nature relationship (Breiting et al., 2009). Several kinds of *knowledge* have been mentioned in the literature on action competence. Next to knowledge about the origins, core features, and effects of the issue at stake, which includes a coherent knowledge of different (academic) subjects related to the issue (Jensen & Schnack, 2006; Mogensen & Schnack, 2010), also knowledge about the relevant facts related to and norms accepted by the stakeholders are necessary. This includes an important focus on knowledge of possible conflicts of interest regarding the issue to be resolved (Mogensen & Schnack, 2010) as well as knowledge of action possibilities that may address the issue (Breiting et al., 2009). Furthermore, a distinction is made between declarative, procedural and meta-cognition concerning actions for solving an issue. Declarative knowledge relates to who is involved, what the action entails, and the reasons for taking a specific action, or the why of it (Breiting et al., 2009). Procedural knowledge refers to the process, i.e. critical reflection on how the action evolved and what hindered or facilitated a successful outcome of the action. Finally, meta-knowledge involves feelings of accomplishment that induce confidence that taking action is meaningful and can contribute to improving life conditions (Breiting et al., 2009). Notably, scholarly efforts for operationalising this knowledge of action possibilities typically took an adult view, describing actions that adults deemed feasible for early adolescents (e.g. Gericke, Boeve-de Pauw, Berglund, & Olsson, 2019). In the following chapters, we will focus on knowledge of possible actions for sustainability issues as seen through an early adolescent lens.

Skills should be transferable to different new situations (Breiting et al. 2009) and are focused on developing confidence instead of paralysing anxiety. They include finding relevant information, followed by critical thinking (Jensen & Schnack, 2006; Hasslöf & Malmberg, 2015; Mogensen, 1997) that should go hand in hand with a positive stance (Breiting et al., 2009; Jensen & Schnack, 2006). This involves critical analyses of and reflection (Mogesnsen & Schnack, 2010) on information and possibilities for change found. Moreover, critical discussions on normative aspects and reflection on ethical issues are

encouraged (Breiting et al., 2009). Furthermore, future thinking is necessary for envisaging a dreamed of future that would result from a successful action (Jensen & Schnack, 2006). As action-competent students are expected to enter in discussion, communicative skills – i.e. active listening/reading and clear spoken and written communication (Jensen & Schnack, 2006) – alongside argumentative communication skills are important (Breiting et al., 2009). Finally, next to taking initiative, action-competent students should also be skilled at cooperation (Jensen & Schnack, 2006) so they are capable of taking not only individual but certainly also collective action (Breiting et al., 2009).

Desire, willingness, and confidence

The desire to be an active participant in resolving environmental or sustainability issues is a motivational aspect (Jensen & Schnack, 2006; Mogensen & Schnack, 2010) that underpins the intention, willingness, or even "drive" to take action (Breiting et al. 2009). It concerns a motivation that strengthens commitment to the action (Jensen & Schnack, 2006) even when barriers are encountered. Next to this strong kind of motivation, confidence is needed for knowledge to be put at work in action-taking (Jensen & Schnack, 2006). Confidence relates to the belief that human behaviour has an impact on sustainability. Consequently, if students are confident that a certain action shows promise for changing a sustainability issue for the better, they will show more courage and endurance, or commitment, to participate in the action. In other words, action competent students show confidence in their own power and opportunities for (co-)influencing sustainability issues (Breiting et al., 2009; Breiting & Mogensen, 1999). However, this trust in their own impact should not be naïve, but well-founded and realistic. When it fulfils this requirement, it may well be an aspect of action competence capable of countering feelings of apathy in front of the complexity and conflict-prone character of sustainability issues (Breiting et al., 2009). In Chapter two of the current dissertation, we will link the motivation and confidence described above to Vallerand's (2015) concept of passion and Bandura's (1977; 2001) self-efficacy theory, respectively.

The place of education in the debate on sustainable development: education for sustainable development

Education for sustainable development (ESD) has been viewed as an educational approach that is capable of supporting students in developing their action competence (UNESCO, 2017). ESD features of holism, pluralism, and an orientation towards action are similar to what is advocated with regard to the democratic educational approach that is believed to foster action competence (Mogensen & Schnack, 2010). The following sections briefly describe the core components that make up ESD, i.e. a holistic approach of learning content, a pluralistic (or democratic) approach to teaching and learning, and an orientation towards action.

Holism and pluralism

Holism and pluralism can be seen as the 'what' and 'how' of teaching, which are closely connected. As sustainable development consists of closely intertwined, but sometimes conflicting interests pertaining to environmental, social, prosperity, peace, and partnership perspectives (UN, 2015), a panoramic lens is necessary. However, *holism* should not be "aiming for a single and uncontested set of understandings and for complete consensus concerning future action" (Stables & Scott, 2002; p. 54). Still, inter-disciplinary educational efforts may allow students to be well-informed when making up their own minds on what actions to take (Gustafsson & Warner, 2008; Varela-Losada, Vega-Marcote, Pérez-Rodríguez, & Álvarez-Lires, 2016). Consequently, a pluralistic stance is taken in order to provide students with opportunities for engaging in democratic negotiation regarding which perspectives to honour and what paths to choose towards a more sustainable future. Pluralism entails allowing different points of view and co-decisions of teachers and students on what and how is learnt (Mogensen & Schnack, 2010; Varela-Losada et al., 2016). As such, it differs from fact-based and normative teaching traditions. Fact-based education is knowledge-oriented and solely aims to provide students with the relevant scientific facts that underly sustainability issues. It assumes insight in scientific evidence will lead to apt behaviour and discussions about norms and values should be held afterwards and separate from the teaching-learning environment (Öhman, 2008). A pluralistic approach also differs from a normative tradition which looks towards scientific findings to form a basis for policy documents and textbooks that prescribe the 'right' behaviour. Here, education's task is to support a transformation towards sustainability by pushing students' behaviour along pre-defined lines (Rudsberg & Öhman, 2010). In sum, ESD aims to provide a broad spectre of perspectives on sustainable development issues and insight into how they support or thwart each other ('what') through holism, while equipping students with the necessary democratic skills so they can make their own decisions ('how') through pluralism (Jensen, 2000; Rudsberg & Öhman, 2010).

Orientation towards action

Next to holism, and pluralism, an orientation towards action characterises ESD (Mogensen & Schnack, 2010; Varela-Losada et al., 2016). Action is defined as a behaviour that is directed towards solving a complex problem by choice of who acts (Jensen & Schnack, 2006). The Problem (or issue) to be solved is typically controversial in terms of how it should be solved (Hungerford & Volk, 1990). The different (contrasting) views on how to solve the issue provide opportunities for discussing different perspectives through democratic debate (Gustafsson & Warner, 2008; Öhman, 2008). Moreover, education will move beyond the school and towards emersion into the local, regional, or global community (Varela-Losada et al., 2016). Furthermore, the voluntary and pluralistic aspects of action guide an orientation towards actions that are chosen by those who will be performing them. Consequently, ESD's orientation towards action should be targeting sustainable development issues the students define as relevant to them and their community

(Mogensen & Schnack, 2010). This implies participative teaching in which students' autonomy is supported as they get to co-decide on what real-world issues will set the path to their learning. Still, up to the start of the current doctoral research, an adult perspective on possible sustainability actions by early adolescents dominated scholarly operationalisation efforts.

In sum, both the concepts of action competence and education for sustainable development are highly complex and multi-faceted. This poses challenges for teachers when they want to implement them into their educational practice (Borg, Gericke, Höglund, & Bergman, 2012; Isac et al., 2022). Also curriculum development needs to be reinvented, as knowledge is constantly renewed and cross-curricular approaches appear to be key if a holistic, pluralistic, and action-oriented approach is to be facilitated. Finally, researchers are inhibited by a lack of measurement instruments for studying the effectiveness of education for sustainable development that is aimed at advancing students' action competence, as is called for in policy documents (Reynolds et al., 2014) and the field of educational effectiveness research (Laurie, Nonoyama-Tarumi, Mckeown, & Hopkins, 2016). The current dissertation will further conceptualise and contribute to an operationalisation of action competence in order to pave the way for ESD effectiveness research.

Research context[1]

Effectiveness research in the field of education (for sustainable development)

From the late seventies of the previous century to date, policy makers have pointed at the importance of education to reduce and mitigate the effects of human behaviour on the planet (UNESCO, 1977; UNESCO, 2017). Education for sustainable development (ESD) has been put forward as an important means for equipping people so they can face the challenges ahead in building acceptable life conditions for all current and future generations across the world (UNESCO, 2017). Yet, learning outcomes of ESD have only recently been put on the agenda of effectiveness research (Reynolds et al., 2014), which typically focuses predominantly on academic learning outcomes in mathematics, language, and science education (Chapman, Muijs, Reynolds, Sammons, & Teddlie, 2016; Sammons,

1 This section was adapted, with kind permission of the author, from Verhelst, D. (2022). *Sustainable Schools for Sustainable Education: characteristics of an ESD-effective school.* (Doctoral Dissertation).

Davis, & Gray 2016). To date, only few studies have taken on the challenge of looking into ESD effectiveness. Regardless of promising findings by scholars who made this effort (e.g. Boeve-de Pauw, Gericke, Olsson, & Berglund, 2015), more research is needed (Laurie et al., 2016). For the current dissertation, the VALIES project (Valorising Integrated and Action Oriented Education for Sustainable Development at School) provided a context in which the first steps could be taken towards including action competence as a learning outcome of ESD in effectiveness studies. In what follows will be sketched the VALIES project and Flemish contexts in which this dissertation unfolded.

The VALIES research project

While being a research project in its own right, this PhD was embedded in the VALIES project and relied on the other research lines within this project. VALIES is a large-scale research and development project focusing on the valorisation of action-oriented approaches to education for sustainable development. This project commenced in September 2017 and was scheduled to run for four years. The VALIES team consisted of several partners from research and educational umbrella organisations (University of Antwerp, Catholic University Leuven, Artevelde University College, Provincial Education Flanders, and Catholic Education Flanders). In addition to this core team, which was responsible for the day-to-day operation of the project, there was also a supervisory committee that oversaw the progress of VALIES and provided feedback. In this supervisory committee several NGOs with a focus on ESD and sustainability, educational umbrella organisations, and governmental educational organisations were represented.

The objective of the VALIES project was dual. First, there was the research part in which the critical factors for effective ESD implementation were investigated. Throughout this investigation, action competence is viewed as a desirable outcome of ESD (Mogensen & Schnack, 2010; Sass et al., 2020). In addition to the current PhD trajectory, four other researchers were involved in the VALIES project, each with their own specific research focus. Secondly, there was the teacher professional development programme in which around 50 primary and secondary schools (from all educational networks) participated. During this professionalisation trajectory, with a pilot in 2018–2019 and a main run in 2019–2021, core teams consisting of two to four teachers for each school were initiated and trained in ESD, the key concepts such as holism, pluralism and action-orientedness, and relevant didactical methodologies. The goal of this professionalisation trajectory was to equip schools, teacher teams, and teachers with the ability to support students' AC development through ESD. The trajectory's main focus was on teacher development and classroom practices. The results of both research and school development components of the VALIES project can be explored in Dutch on the website (www.edoschool.be) that was launched on 1 June 2022.

ESD in Flemish school organisations

Although this dissertation does not intend to describe the state of the art of students' action competence and their teachers' ESD implementation within Flemish schools, it is important to convey the specificity of this regional and policy context to the reader so that situational factors can be aptly appreciated. In Flanders, the Dutch-speaking northern region of Belgium, the educational field enjoys substantial autonomy. With freedom of education embedded in the Belgian constitution, the jurisdiction of the Flemish government is largely limited to the definition of minimum educational goals, the recognition of schools, and the allocation of finances. The pedagogical methods, curricula and educational vision all remain the responsibility of the schools, which are often grouped in governing boards and linked to educational umbrella organisations (European Commission, 2020).

As from schoolyear 2019-2020, the Flemish government implemented new minimum educational goals for secondary education, starting with the first cycle (12 to 14-year-olds). Over the course of the following two schoolyears, the new goals were to be implemented in this cycle, i.e. grades seven and eight (Decree concerning the educational goals for the first cycle of secondary education, 2019)[2]. In these new minimum goals, sustainability and key principles of ESD are incorporated (Belgisch Staatsblad, 2019, April 26; p. 40619). For instance, one key competence focuses on sustainability and is reflected in more than ten different educational goals such as "the students explain the complexity and entanglement of sustainability issues", which reflects a *holistic* perspective. The minimum educational goals for primary education, in effect since 2010, do not directly refer to sustainable development or ESD as such. Nevertheless, here too a clear association can be found with the core principles of ESD. For example, for the learning area 'people and society' it is stated that phenomena should always be approached from different perspectives and that such a *pluralistic* approach should be integrated when working on these educational goals (AHOVOKS, 2021). While the autonomy of the schools offers many opportunities for defining their own trajectory and educational approach, it also necessitates a responsibility to invest in an effective ESD implementation that exceeds what is minimally required and translates the complexity of sustainability and ESD into effective educational practice.

---

2 Decreet betreffende de onderwijsdoelen voor de eerste graad van het secundair onderwijs (Belgisch Staatsblad/Moniteur Belge, 2019) [English translation by the author]

Research aims, design, and outline of this dissertation

At the start of the doctoral research described in this dissertation, three research gaps were identified. Firstly, there was the need for a clear (re)definition of the action competence concept as either an educational approach or a competence of (groups of) individuals. Secondly, action competence was to be operationalised so it could be made measurable in order to allow monitoring of ESD implementation efforts. Thirdly, evidence-based research was missing for theoretic claims that action-oriented education for sustainable development would be a suitable educational approach for fostering students' action competence.

Research aims

As described above, both policymakers and scholars underscore the needs for action competence, an educational approach (i.e. ESD) that would foster it, and tools for monitoring the effects of such approaches on students' action competence development. Therefore, this PhD focused on the following aims:

- disentangling the confusion regarding what action competence is, i.e. further conceptualising the concept of action competence (in the context of sustainable development);
- operationalising the redefined concept of action competence (in sustainable development, i.e. ACiSD) in order to make it measurable as a student learning outcome;
- investigating whether teachers' education for sustainable development approaches affect students' ACiSD development.

In this, we took an emancipatory stance towards early adolescent participants with an overall fourth aim to give them a voice by including their perspectives. Thus, five research questions guided as many studies:

1. What is action competence in sustainable development (ACiSD)?
2. What actions for sustainable development do early adolescents suggest for someone their age?
3. How can ACiSD be measured?
4. Do classrooms matter to ACiSD development?
5. Does education for sustainable development affect changes in ACiSD?

Research design, outline and flow of the studies

We will now provide an overview of methods used and flow of the different studies. Chapters two to six in this book are dedicated to each of the five studies that constitute the

current dissertation. From a methodological perspective, we took a pragmatic stance in which the research aims and questions guided the flow of five studies. Therefore, we adopted an exploratory sequential multi methods design, which is recommended for investigating complex real world issues in social and educational contexts (Creswell & Creswell, 2018; Teddlie & Tashakkori, 2009). The core issues we looked into (ESD implementation and ACiSD) qualified as such. Consequently, the five studies presented in this dissertation build on to each other and made use of qualitative, followed by quantitative methods to accomplish the aims and answer the questions central in this research project (as can be seen in Figure 1). In a sequential mixed-method design qualitative and quantitative methods are used chronologically (Creswell & Creswell, 2018; Teddlie & Tashakkori, 2009). We started with two qualitative studies in which we focused on conceptualisation and analysis of narratives. The first study (Chapter 2) reviewed the literature in order to redefine the concept of action competence as a generic competence of people, exemplifying it in the context of sustainable development as action competence in sustainable development (ACiSD). With this conceptual study we accomplished the first aim, i.e. disentangling the confusion in the literature regarding this concept, answering the question of what ACiSD consists. In the second study (Chapter 3) we provided opportunities for early adolescents to find and use their voice, answering the question what actions for sustainable development they thought most urgent and feasible for someone their age. This study analysed the narratives of early adolescents in a purposive sample selected to maximise preferred ways of expression, e.g. verbal, visual, and artistic. Both qualitative studies built the fundaments for the third study (Chapter 4). While study 1 provided a clear definition of the phenomenon of interest, i.e. ACiSD, study 2 informed the generation of an initial item pool of actions for sustainable development. Thus, study 2 was used as a pre-study for the third study, that answered the question of how ACiSD can be measured with the development and validation of a measurement instrument: the Action Competence in Sustainable Development Questionnaire (ACiSD-Q). The third study formed the transition from a qualitative to a quantitative methodology and made use of a second sample, this time collected through convenience sampling in the context of the VALIES project. Whereas the first two studies were purely qualitative, the ACiSD-Q development and validation study was supported by qualitative and quantitative steps for construction, content, and statistical validation of the questionnaire. Through quantitative analyses the subsequent two studies provided answers to questions about the theoretic claims that education for sustainable development would enhance students' ACiSD. Both studies made use of a third sample that was again obtained through convenience sampling. Study 4 looked into the importance of the classroom level (Chapter 5), while the fifth and final study investigated the effects of an action-oriented ESD approach on students' ACiSD development (Chapter 6). Thus the last two studies provided insight into theoretically assumed links between an action-oriented ESD approach and its desired learning outcome, i.e. ACiSD.

As the following chapters are each based on a published or submitted paper in academic journals, they can be read independently from each other. Consequently, some parts overlap across the five studies and respective chapters in this dissertation.

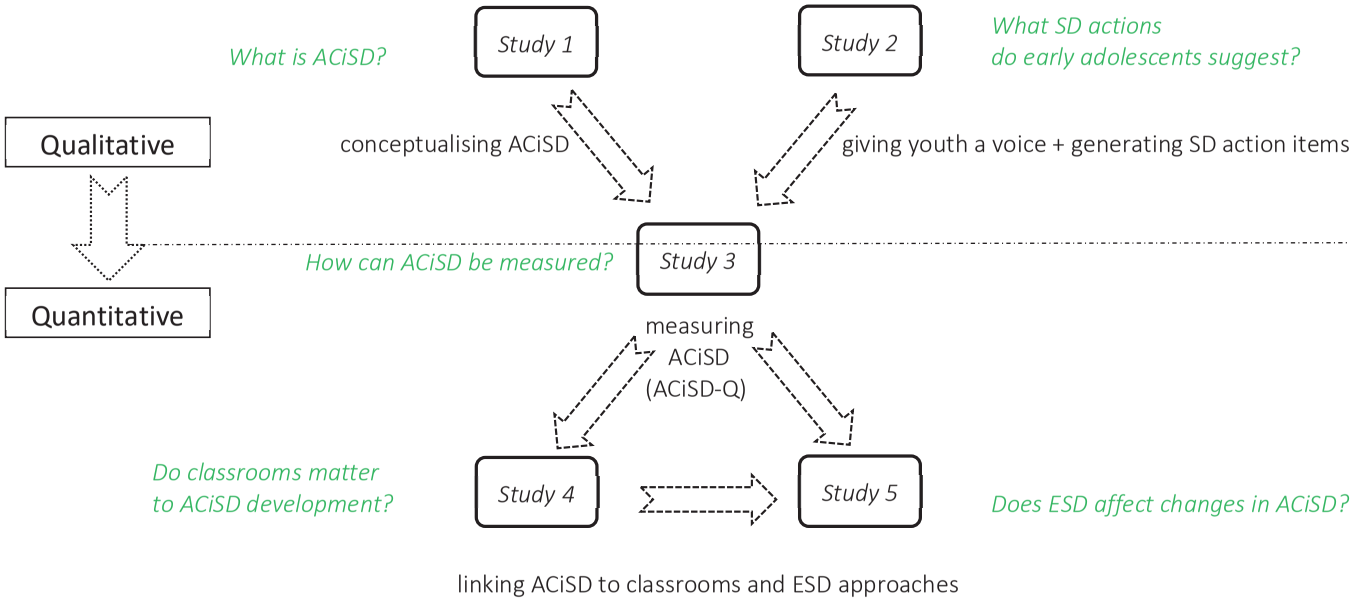


Figure 1. Overview and flow of the five studies with their aims (in black) and main research questions (in green)

Chapter 2

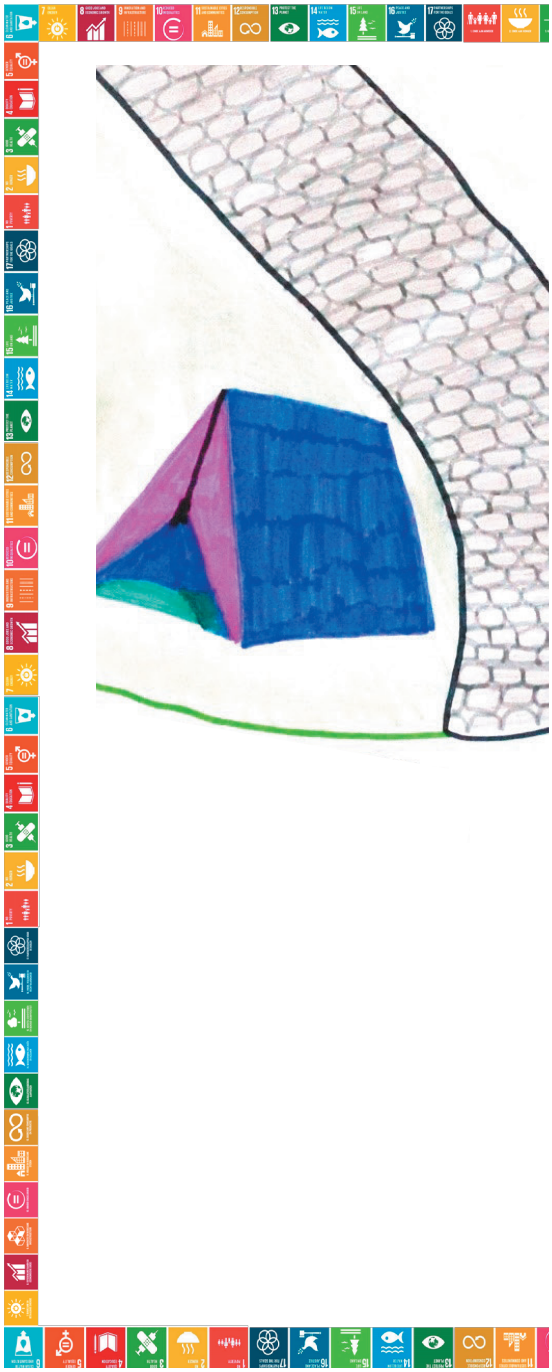
Redefining action competence:

The case of sustainable development

Chapter 2

The concept of Action Competence (AC) has been interpreted in different ways in various domains of the educational sciences. These diverse interpretations are problematic because they hinder common understanding of the concept among scholars. We unravel the interpretation of AC as a competence of people versus that of an educational approach. We call the latter education for sustainable development (ESD), and discuss the approach as predominantly being a subjectification model of education. Furthermore, we offer an updated generic definition of AC as a competence of people. To this end, we develop an ecology of psychological concepts that underpin AC. We present a theoretical perspective based on the concepts of "action" and "competence", for stronger consideration of AC as a competence of people. We relate this generic concept of AC to concepts such as commitment, passion, knowledge, and self-efficacy. Finally, we introduce the specific concept of "Action Competence in Sustainable Development" (ACiSD) to articulate the competence of people for engaging in solving sustainability issues.

This chapter is based on Sass, W., Boeve-de Pauw, J., Olsson, D., Gericke, N., De Maeyer, S., & Van Petegem, P. (2020). Redefining action competence: The case of sustainable development. The Journal of Environmental Education, 51(4), 292-305. doi: 10.1080/00958964.2020.1765132



Redefining action competence: The case of sustainable development

"I believe in our human capacity to care deeply and to act collectively. I believe in our human capacity to do what is right if we let ourselves feel it in our hearts. The children cannot live on words and empty promises. They are waiting for you to act. Please, open your hearts. And then, act."

Elizabeth Wathuti (26, Kenya, at UN COP26, 2021)

Introduction

The concept of Action Competence (AC) has been defined in different ways in various domains of the educational sciences. In the fields of environmental education (EE), health education, and education for sustainable development (ESD), diverse perspectives can be found concerning AC. Some view AC as a latent competence of people in favour of an overarching goal such as improved health or sustainable development (e.g. Chawla & Flanders Cushing, 2007; Clark, 2016), while others claim it should be considered as an educational approach (e.g. Ellis & Weekes, 2008). We aim to unravel this conceptual confusion by starting from the original definition by Schnack (1993b; as cited in Breiting et al., 2009, p. 44), who introduced the concept in the field of political education in terms of the ability and willingness to be a competent participant.

In our current paper we redefine AC as a generic concept related to solving controversial problems in various domains. To this effect, we describe the ability of people (an individual or group of individuals) to act toward solving such problems. In this effort of refining the definition of AC we develop an ecology of psychological sub-concepts and their interrelations, which underpin the construct of AC. We thus offer an updated generic definition of AC as a competence of people or groups. With this contribution we hope to pave the way for the research community to further operationalise AC and develop research that can make use of the fruitful concept of AC. We also give an example of how this can be done within the domain of sustainable development (SD).

Aim of this Paper

The aim of this paper is fourfold. We first position ESD in a framework of 'good' education, describing it as a subjectification model oriented toward action taking in the section titled *Good Education: Purpose and the Need for Action*. In the second section, titled *Problematising the Concept of Action Competence*, we aim to conceptually explore the existing literature on AC and its sub-concepts, and to unravel different interpretations of AC, distinguishing between AC as an individual/collective competence of people on the one hand, and an educational approach on the other. In order to avoid the confusion between the concepts 'action competence' and the 'action competence approach', we will refer to the 'action competence approach' as ESD, which aims at fostering AC within learners. Here, we will argue for considering the concept of action competence as a generic competence of people, that is not necessarily embedded in ESD, since it was developed within different fields, such as EE (Jensen & Schnack, 2006) and health education (Jensen, 2000). *Constructing a Generic Definition of AC as a Competence of Individuals or Groups* is the third section, which is devoted to our redefinition of AC. Finally, answering Jensen & Schnack's (2006) call for a further investigation on how AC relates to different fields, we discuss the case of action competence in the field of sustainable development in *AC and the Case of Sustainable Development*.

Good Education: Purpose and the Need for Action

In the ongoing discussion on what makes for good education, Biesta (2015) posits that the purpose of education should be a guiding principle. In Biesta's (2009a, 2009b, 2015) model of 'good' education, purpose consists of three functions, i.e. qualification, socialisation, and subjectification. The qualification function concerns offering the knowledge, skills, and understanding so that learners can "do something" (Biesta, 2009b, p. 39). The socialisation function focuses on fitting learners into an existing social, cultural, and political order. Contrary to the latter, the subjectification function supports learners in becoming autonomous and independent thinkers and agents (Biesta, 2009b). Consequently, when answering the question whether a certain approach to education can be considered good, we should look into the underlying views about these three functions. The question to be answered then becomes what kind of qualification, socialisation, and subjectification education should be directed at (Biesta, 2009b). Biesta (2009a) argues against a socialisation that would lead to a reproduction of the existing socio-political order. Instead, he calls for a form of citizenship that is more critical and political in a "sphere of plurality and difference" (Biesta, 2009a, p. 154). This is in line with concepts such as pluralism (Öhman, 2008), environmental political participation (Levy & Zint, 2013), and collective action competence (Clark, 2016).

Next to pluralism, an orientation towards action is another main principle in ESD, which is in line with Chawla's (2009) call for paying more attention to fostering action through education. According to Chawla (2009) action is called for in times when the natural world is at risk. Consequently, education should move beyond reproducing knowledge, values, and attitudes. Similarly, Eames, Cowie, and Bolstad (2008) posit that it takes more than knowledge, skills, and attitudes to facilitate behaviour. Supporting students in taking action thus becomes one of the main purposes of education (Chawla, 2009; Eames et al., 2008). This focus on action can be viewed as the socialising aspect of ESD, which aims at introducing learners into a society that values active citizens. However, action is a behaviour that is decided upon by who acts and directed toward problem solving (Jensen & Schnack, 2006). For this reason, education should empower people so they are well-informed and capable of taking action they decided on themselves. Contrary to the socialisation aspect inherent in the action-focused orientation of ESD, this aim to empower rather than prescribe points toward a subjectification model of education. However, this reorientation of education from prescribing the 'right' behaviour to equipping people with the necessary competence for taking action, proves to be a challenging task for schools (Boeve-de Pauw & Van Petegem, 2013; Olsson, 2018). In the field of EE efforts made by e.g. eco-schools often resulted in increased knowledge (e.g. Krnel & Naglič, 2009) or affected values rather than behaviour (e.g. Boeve-de Pauw & Van Petegem, 2011; 2013; Krnel & Naglič, 2009). Still, Swedish research found evidence for more frequent sustainability behaviour, when education focuses on ESD principles of pluralism, which involves student-teacher co-decision on topics, critical thinking, and welcoming different points of view

(Boeve-de Pauw et al., 2015). Rather than reproducing established norms, as is the purpose in a normative educational tradition, this notion of pluralism strives for students to form their own well-informed opinions and act upon them (Berglund & Gericke, 2018). Moreover, this inclusion of different perspectives within pluralism resonates with a call for ensuring quality education through ESD as expressed in policy documents of the United Nations (2015). After evaluating how much was achieved of the Millennium Development Goals, the United Nations drew up 17 Sustainable Development Goals (SDGs). The fourth goal in this list presupposes ESD and aims to 'Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all' (United Nations, 2015, p. 17). In this, we see alignment between the UN document and the research findings we discussed above. Both argue in favour of inclusion and quality (United Nations, 2015) or good education (Biesta, 2009a, 2009b).

As mentioned above, good education looks into the purpose of education. We posit that the principles of pluralism and action as combined in ESD, offer possibilities for answering Biesta's (2009a) argument for a subjectification model of education as well as Chawla's (2009) call for a stronger focus on action. Indeed, the purpose of ESD is to empower learners (subjectification), so they are capable of developing AC (Breiting et al., 2009; Mogensen & Schnack, 2010). As such, ESD can be considered 'good education' along the lines of Biesta's (2009a, 2009b, 2015) model of purposeful education, while also focusing on action as called for by Chawla (2009).

Now that we have outlined how ESD can be considered an example of 'good' and action-oriented education, we will turn to unravelling different understandings of the concept of AC.

Problematising the Concept of Action Competence (AC)

In what follows we problematise the concept of AC and explore how it is defined in the literature. First, we will describe the different understandings of AC as a competence of people and as an educational approach. In this, we will argue for redefining AC as a generic competence of people. Secondly, this section will describe how 'action' and 'competence' have been defined by the original authors within their conception of action competence. We will zoom in on 'action' and its implication for the quality of education in terms of being predominantly a subjectification model of 'good education', before looking into the definition of 'competence' within the concept of AC. For this, we draw from the seminal work of the Danish School of Education (e.g. Breiting et al., 2009; Mogensen & Schnack, 2010; Jensen, 2000, Jensen & Schnack, 2006).

Action Competence: an Educational Approach or a Competence of People?

Since it was first introduced in the 1990s (e.g. Mogensen, 1997) the concept of AC has sparked different interpretations within the fields of EE (Jensen & Schnack, 2006), health education (Jensen, 2000), and ESD (Bonazzi Piasentin & Roberts, 2018). As Bonazzi Piasentin and Roberts (2018) pointed out, it has been understood by some as being an educational approach (e.g. Ellis & Weekes, 2008), and by others as a competence of individuals and groups (e.g. Chawla & Flanders Cushing, 2007; Cincera & Krajhanzl, 2013). In 2006, Jensen and Schnack repeated their call for a further discussion on the different sub-concepts of AC in order to allow 1) the concept to become operational and 2) to find out what educational approach and content would help develop AC. In this call we discern the potential development of the original concept into a competence of individuals, as well as into an educational approach. However, this may also have been the source of confusion as to whether AC should be seen as an educational approach or rather as an individual or collective competence of people (Bonazzi Piasentin & Roberts, 2018). In line with e.g. Cincera and Krajhanzl (2013), who tested students' action competence, we would argue for viewing AC as a generic competence of (groups of) individuals, because it can be considered as a desired learner outcome of a subjectification model of education within a societal context that values active citizens. Consequently, we will further explore the concept of AC in this way in what follows.

Exploring the Concept of Action and its Implications for the Quality of Education

Problem solving becomes wickedly challenging when the issue at stake is so complex that it gives rise to different views on how to solve or overcome it. The concept of 'action' engages with this kind of controversial problems (Hungerford & Volk, 1990). As such, it calls for a kind of education that empowers rather than dictates what should be accepted as appropriate behaviour. If education is designed to equip people for finding solutions to such controversial problems, it will inevitably move away from normative traditions and favour pluralistic approaches that empower people.

As shown in Table 1, which summarises types of action, core features, and related concepts, 'action' is defined as a behaviour that is voluntary, and targeted at bringing about change (Jensen, 2000) or solving a controversial problem (Breiting et al., 2009) or 'issue', i.e. something that is at risk and about which there is controversy on how to manage the necessary change (Hungerford & Volk, 1990). Action differs from mere behaviour in that it is decided upon by the agents themselves, and from an 'activity' in that it is aimed at solving an issue. Since action involves "inner decision making" of who acts (Jensen, 2000, p. 148), it touches at a subjectification model of education. Whereas a socialisation model aims at a reproduction of the existing socio-political order, a subjectification model is set to enhance political agency and critical citizenship (Biesta, 2009a). Thus, within the context of a society that is set to solve issues through citizen action amongst other things, ESD can be

considered a subjectification model due to this aim of empowering and promoting a critical stance.

Table 1. Summary of types of action, core features, and related concepts

Types of action	Core features	Related concepts
action (Jensen & Schnack, 2006)	- voluntary, decided upon by the agent (e.g. Jensen, 2000; Mogensen & Schnack, 2010) - directed at solving an issue (e.g. Breiting et al., 2009; Hungerford & Volk, 1990; Jensen, 2000)	- agency (goal chosen by the agent; Bandura, 2005) - (political) subjectification model (Biesta, 2009a; 2009b); - pluralism (Rudsberg & Öhman, 2010); - critical thinking skills (Hasslöf & Malmberg, 2015; Rudsberg & Öhman, 2010) - envisaging the future (Jensen, 2000) - purposive behaviour (Mogensen & Schnack, 2010) - forethought (Bandura, 2005); - intentionality (Bandura, 2001; 2005)
direct and indirect action (Jensen & Schnack, 2006)		- proxy agency (Bandura, 2001) - environmental political participation (Levy & Zint, 2013)
individual and collective action (Clark, 2016)		- collective civic action (Levy & Zint, 2013)

When the issue at stake is characterised by different, often even contrasting, opinions on how to solve it, individuals are confronted with the need for making up their own minds. SD issues qualify as such controversial problems, when contrasting environmental, social, and economic interests are pursued. Consequently, ESD is bound to move away from a normative tradition in which the purpose of education is to teach students about the 'right' sustainable behaviour, presenting them with the required values and attitudes as outlined by experts and policy makers (Rudsberg & Öhman, 2010). As such, this normative approach would be in line with a socialisation model, that aims at a reproduction of an established order (Biesta, 2009a). ESD is gradually moving toward a more democratic and 'pluralistic' tradition, that offers students the opportunity to find their own voice among different perspectives through deliberative conversations and the development of critical thinking skills (Hasslöf & Malmberg, 2015; Rudsberg & Öhman, 2010). Agents can then make well-informed decisions on which behaviour they find adequate and are willing to perform, i.e. which action they want to take. This allows for a more volitional approach to (sustainable) behaviour in the spirit of 'action' (Jensen, 2000). It is also in line with Biesta's (2009a) definition of political subjectification, which is set to promote political agency. This may

lead to a critical and political form of citizenship (Biesta, 2009a), and to resistance to a societal order (Biesta, 2009b). In the field of EE, Levy and Zint (2013) conceptualised environmental political participation as all forms of action directed towards influencing environmental governance. The scale of environmental issues has not only called for individual action, but also needs collective civic action (Levy & Zint, 2013). Likewise, Ostrom (2014) argues for action at different scales, from 'the household to the globe' (p. 116), because all scales would also benefit from solving the severe threats they are confronted with. Moreover, she points out that top-down initiatives from global or even national administrations suffer with some disadvantages. Firstly, they are likely to take too long before they produce visible benefits. Secondly, they are prone to many counter-productive side effects such as free riding and a simple exportation from one location to another of behaviour that produces more risk than it solves (Ostrom, 2014). Biesta (2009a) also argues in favour of collective rather than individual learning if citizenship education is to promote an active citizenship that allows conflict and contestation instead of being directed towards a status quo of the established order. Solution-directed collective action refers to the voluntary behaviour of a group of people that is aimed at a common goal. Results from research evaluating a programme for promoting action taking for human rights, equally found that participating students themselves were more inclined to take collective than individual action (Činčera , Skalík, & Binka, 2018). This needs a collective literacy and competence, i.e. skills and experiences (Clark, 2016). Furthermore, both individual and collective action can be direct or indirect. Direct action focuses on a direct contribution to solving the issue at stake, whereas indirect action seeks to make others contribute (Jensen & Schnack, 2006). The latter is comparable to proxy agency, i.e. when for example citizens try to get their legislative representatives to act on their behalf to achieve the desired outcomes (Bandura, 2001). Both types of action can occur in combination when indirect actions lead to direct actions. An example of such a combination is when activists induce politicians (indirect action) to implement a certain agenda aimed at mitigating climate change (direct action).

To understand what competence is required for action taking (see next section), we will first highlight features of action that are related to willingness, knowledge, skills, and trust in one's influencing possibilities and how this involves both individual and collective efforts. As mentioned before, action is volitional and targeted at solving an issue (Jensen, 2000). Consequently, it is a conscious and purposive behaviour (Mogensen & Schnack, 2010) that requires forethought and intentional planning. Along with self-reflectiveness and self-reactiveness, forethought and intentionality or planning are two features of agency as described by Bandura (2005). Forethought includes voluntary goal setting and a cognitive visualisation of a future after actions will have been taken. The action gets direction and motivation through this anticipation of likely outcomes (Bandura, 2005). This is in line with visions of life in the (dreamed of) future world, a dimension of knowledge as put forward by Jensen (2000) when discussing action competence. Similar to the definition of action as being behaviour that is decided upon by who acts (Jensen, 2000), forethought also involves a goal chosen by the agent (Bandura, 2005). Intentionality or planning concerns a proactive

commitment. This involves action plans and strategies for making future actions happen (Bandura, 2001; 2005). It also requires insight in the circumstances in which the action will be performed, and knowledge of action possibilities (Breiting & Mogensen, 1999) that occur in the given circumstances (Jensen, 2000). When circumstances are such that management of the issue at stake is governed by a fast-evolving knowledge base, as in the case of e.g. SD, environmental, and health issues, a great flexibility to adapt decisions and actions to new insights is deemed necessary (Almers, 2013; Bandura, 2001). Consequently, (groups of) individuals have to be prepared to constantly reconsider their own previous interests, concepts, theories, values, and decisions on what action is necessary in order to solve the issue they selected (Almers, 2013; Mogensen, 1997).

However, this critical attitude is both required and problematic when considering action, as it may produce a discouraging effect. New insights may contradict previous knowledge. This means that a critical stance is paramount, not only toward different perspectives, but also toward one's own (possibly outdated) knowledge, insight, and previous actions. However, this may lead to a lack of motivation, when people feel the strategies they have used so far, turned out to be inadequate (Pelletier, Dion, Tuson, & Green-Demers, 1999). To counteract this possible feeling of discouragement, critical reflection has to go hand in hand with a "language of possibility". The latter involves an orientation toward finding inspiration in courses of action that have proven successful in other times, places, and cultures (Mogensen & Schnack, 2010, p. 71). We posit that collective action, even on an international scale, may well be a potent tool for finding this language of possibility, courage, and inspiration. Current events that are spreading from Sweden, via Europe to Africa, Australia and the United States (and counting) with school children going on strike and marching in favour of more ambitious climate policies, seem to point in that direction (see for example coverage by The Guardian on 24 May 2019).

Competence in the Concept of Action Competence

Since the concept of AC was first introduced in terms of "being able to (and wanting to?) be a competent participant" (Schnack, 1993b, as cited in Breiting et al., 2009, p. 44), different meanings of the notion of competence have emerged. When competences are directed toward performing specific tasks, they have been defined as the ability to integrate knowledge, skills, and attitudes (e.g. Janssen-Noordman, Merriënboer, van der Vleuten, & Scherpbier, 2006). Contrary to this interpretation in the context of qualification for a specific job, leading to a socialisation model of education, action competence refers to "the need for relevant knowledge, will, skills and not least critical reflection, including values clarification" (Mogensen & Schnack, 2010, p. 63). When considering competence in a context of finding solutions to problems that entail controversy on how to solve them, competence asks for a different conceptualisation than when it is directed toward performing a specific task that is well-outlined by others than the one who is to perform it. The competence is then aimed at a personal development that enables thinking about

complex issues without getting stuck in preconceptions, prejudices, and unquestionable beliefs. Thus, it inevitably involves a critical attitude and the intention to take charge of personal and societal conditions (Mogensen & Schnack, 2010). Consequently, the development of AC aims at empowering people (subjectification), rather than serving the purpose of being qualified to perform adequately in doing a certain job, or uncritically reproducing an established order (socialisation). This emphasis on critical thinking is in line with Biesta's (2009a) argument for a critical and political form of citizenship. Thus, an educational approach that fosters students' AC, aims at enhancing confidence in their own influencing possibilities (Breiting et al., 2009), and developing their knowledge (Jensen & Schnack, 2006), courage, commitment, and willingness to engage in finding solutions to controversial problems (Breiting et al., 2009; Jensen & Schnack, 2006, Mogensen, 1997). Or, as Jensen and Schnack (2006, p. 472) put it: "They have to learn to be active citizens in a democratic society". As this involves democratic decision making in matters of collective issues, it involves social abilities that facilitate communication between subjects. The ability to approach an issue in a pluralistic way, i.e. taking different perspectives, views, and values into account (Öhman, 2008) fits such a context. Nevertheless, this social interpretation of 'competence' inevitably also involves a personal competence of individuals to view the world critically and to be self-reliant and autonomous.

In line with Breiting et al. (2009), and Mogensen and Schnack (2010), who distinguished social as well as personal dimensions of AC, the current paper aims to further conceptualise AC as a synergistic competence that can be expressed both at an individual and a collective level. Drawing from Bandura (2001; 2005), Biesta (2009a; 2009b), Breiting et al. (2009), Clark (2016), Jensen and Schnack (2006), Levy and Zint (2013), Mogensen (1997), and Mogensen and Schnack (2010), we will, however, define AC more generically, i.e. not embedded in a specific context. Thus, we start from the following (working) definition:

action competence entails the willingness, commitment, knowledge, skills and confidence to engage in finding solutions to controversial problems or issues.

Constructing a Generic Definition of AC as a Competence of Individuals or Groups

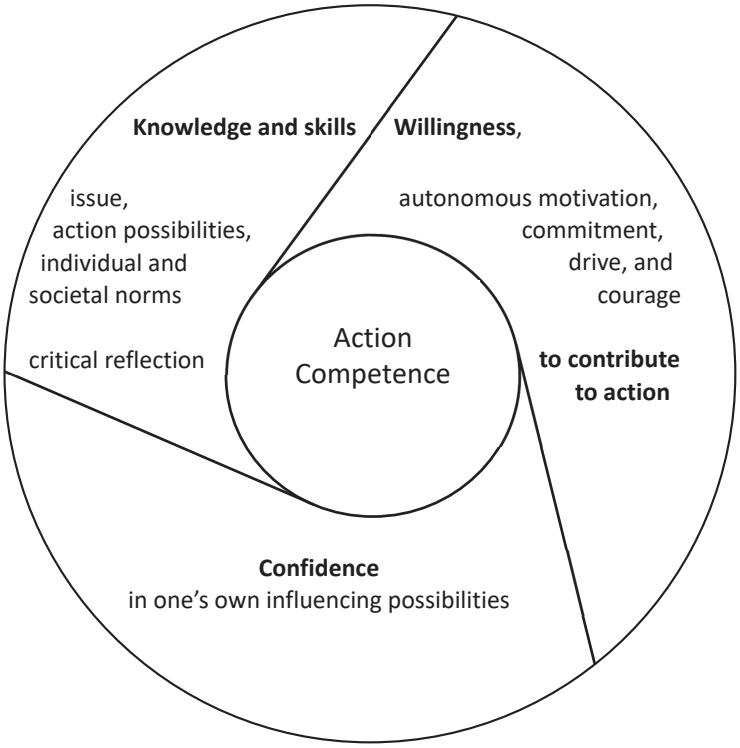


Figure 2. Core features of action competence based on Breiting et al. (2009), Jensen (2000), and Jensen & Schnack (2006)

Starting from the core features of AC as described by the Danish School of Education (see Figure 2), we will finetune the definition of AC. To this effect, we will break down AC into the willingness/passion-commitment, knowledge/skills, and confidence/self-efficacy that are needed for taking an active part in a pluralistic approach to solving complex (collective) problems that involve controversy. In what follows, we will zoom in on each of these sub-concepts of AC. Each part of this section ends with a summary of what the AC individual comprises for that part. Finally, an overarching definition of an AC individual will be presented verbally and graphically.

Willingness in Relation to AC: the Passion and Commitment to Act

If knowledge is to lead to action, then individuals need to be passionate about contributing to finding a solution. This is in line with the required motivation, commitment, drive, and courage to contribute to bringing about change that was put forward by the researchers

who first defined AC (e.g. Jensen, 2000; Jensen & Schnack, 2006). Because action is a volitional behaviour, we argue that the motivation needed to perform it, should also come from within rather than being imposed by others onto who acts. This points towards autonomous motivation, which involves volition and choice by the individuals themselves (Vansteenkiste, Lens, & Deci, 2006). Moreover, this autonomous motivation should be strong enough to allow for the drive and courage needed in order to persevere notwithstanding possibly disappointing results of efforts made (Jensen & Schnack, 2006). Consequently, we would argue that if an agent is driven to act with 'willingness', this involves a strong and voluntary type of autonomous motivation and commitment that is consciously aimed at taking action in agreement with the norms and values of the agent(s). We posit that harmonious passion is such a type of motivation. It allows individuals to engage in an activity that they like and have chosen for, whereas obsessive passion is a more (externally or internally) controlled kind of motivation (Vallerand et al., 2003). Still, both types of passion strongly lead to persistence when outcomes are felt to be beneficial. The difference between them lies in the rigidity of the persistence when outcomes are negative. When driven by harmonious passion, individuals are in control and can choose whether to persist or quit in case of negative outcomes. Obsessive passion does not allow for such choice. Here it is the passion that controls the individual, which leads to a more rigid, and less adaptive persistence (Vallerand, 2015; Vallerand et al., 2003). Whether a person develops harmonious or obsessive passion highly depends on the social context. When that context promotes autonomy, passion for a certain activity will evolve toward harmonious passion. A controlling environment will foster obsessive passion (Vallerand, 2015). Moeller, Keiner, and Grassinger (2015) argued, however, that both types of passion occur in alignment within individuals. They repeatedly found that individuals are either highly passionate or not passionate at all, showing high or low scores on both harmonious and obsessive passion. Moeller et al. (2015) aptly described both types of passion as 'two sides of the same coin'. When people are passionate about an activity, they dedicate considerable amounts of energy to it over a long period of time, sometimes even a lifetime (Vallerand et al., 2003), persisting in spite of obstacles and negative experiences (Moeller & Grassinger, 2013).

In line with Jensen (1997), we argue that it is this kind of strong motivation, commitment, drive, and courage that is needed for taking action, which is per definition targeted at solving an issue that is autonomously selected by who acts. Moreover, Moeller and colleagues (2015) also found moderate correlations between passion and commitment. The latter was conceptualised as consisting of intent, identification with the goal, and long-term goal setting. This led them to develop a commitment and passion model, in which the two concepts were combined as both explain behavioural persistence in goal-directed activities (Moeller & Grassinger, 2013). Action involves autonomy and volition (Jensen, 2000), as well as persistence in the face of difficulties inherent in the issues to be solved. Since action is directed at solving challenging controversial problems, it requires a long-time dedication to maintaining efforts in order to do so, and well-informed planning (Jensen & Schnack, 2006). This is why we argue that the willingness, drive and commitment

to take action can be understood as the commitment and passion to be involved as described by Moeller and Grassinger (2013). Following our contribution to what kind of motivation and commitment (Jensen & Schnack, 2006) is necessary for knowledge to be put into action, we will now turn to the question as to what knowledge is considered relevant.

Knowledge and Skills in Relation to Action Competence

According to Jensen and Schnack (2006, p. 473) ”competence is associated with being able, and willing to be a qualified participant”. Consequently, individuals who are committed and passionate about taking up responsibility in solving controversial problems, need relevant action-oriented knowledge and skills in order to be the ”qualified participants in democratic processes” (Breiting et al., 2009, p. 57) these issues call for. This means that both knowledge about the issue and societal knowledge about democratic processes are involved, each with the skills required for acquiring such knowledge and acting upon it.

Action is directed at complex and controversial problems. Therefore, knowledge about the many (interrelated and possibly conflicting) aspects of such issues is needed in order to deal with them competently. This knowledge should be coherent (Jensen & Schnack, 2006) as well as flexible (Almers, 2013; Bandura, 2001; Mogensen, 1997). This means that knowledge from different fields should not exist in a fragmented fashion, but needs to be understood as an interconnected whole, while the learner should also be flexible enough to adapt their knowledge when new (possibly contradicting) knowledge emerges. Therefore, qualified agents know how and where to find relevant and accurate information. Issue-related knowledge includes information about the core features of the issue, such as its origins (Jensen & Schnack, 2006), causes, effects, and who is involved and affected (Jensen, 2000). Also knowledge of action possibilities for solving the issue is required (Breiting et al., 2009; Breiting & Mogensen, 1999; Jensen & Schnack, 2006). In order to gain such knowledge, a clear view of what desired future conditions the agent(s) want to act towards is needed to give direction to the actions that are undertaken. Consequently, the action competent individual is skilful at envisaging the future (Jensen & Schnack, 2006; Bandura, 2005). Next to issue-related knowledge and knowledge of action possibilities, agents need to know about current norms at a societal as well as at an individual level (Breiting et al., 2009). This points to the need for a level of self-reactiveness that allows them to compare both societal and personal sets of norms and standards (Bandura, 2001). This should allow alignment of actions with personal and societal norms, that may call for a critical stance towards ruling norms in society as well as towards personal norms. Consequently, critical thinking is a required skill for action-competent individuals (Jensen & Schnack, 2006). This involves reflection, since the individual should also be capable of scrutinising their own rationale in order to be able to argue for a point of view, or preference for a certain action (Breiting et al., 2009). This, we would argue, is in line with Bandura’s concept of self-reflectiveness, i.e. the ”metacognitive capability to reflect upon oneself and the adequacy of one’s thoughts and actions” (Bandura, 2001, p. 10).

From the discussion on knowledge and skills related to AC as depicted above, we conclude that the action competent individual knows where to find knowledge concerning the issue and action possibilities for solving it. Moreover, they are critical thinkers, i.e. (self-) reflective and willing to share their arguments for points of view and preferred actions. They are willing and capable of considering alternatives and adapting their behaviour to newly found insights. Finally, they are capable of envisaging a desired future situation and anticipate outcomes. Now that we have explored the AC dimensions of willingness, knowledge, and skills, we will turn to the dimension of confidence.

Confidence and Self-efficacy in Relation to Action Competence

In order for knowledge to lead to action, individuals need the willingness and the confidence to engage. This entails confidence "that they can apply skills successfully" (Chawla, 2009, p. 7) as well as confidence that their actions will produce the outcomes they anticipated (Bandura, 1977) and that they have good influencing possibilities (Breiting et al., 2009). According to Bandura (1977) this outcome expectancy, i.e. the belief that a given behaviour will produce the desired effect, is affected by efficacy expectations. The latter is the agent's confidence that they are capable of performing that behaviour (Bandura, 2001). Consequently, people will engage in action if they have confidence in their capacities to perform the necessary behaviour (mastery) and believe that the action, when successfully performed, will contribute to solving the issue at stake. That confidence in their mastery then determines whether the agent will start and persevere in performing the action even when facing obstacles (Aguilar, 2018; Bandura, 1977). This effect of personal efficacy was noted both at an individual and a collective level by Aguilar (2018), while Chawla and Flanders Cushing (2007) also found that personal efficacy of individuals enhanced efficacy at group level and vice versa.

At a societal level Levy and Zint (2013) distinguish between internal and external (political) efficacy. More specifically, internal efficacy regards the individual's confidence in their own understanding of politics and their competence to take part in political action, while external efficacy regards confidence in their capacity to influence governmental decisions (Miller, Miller, and Schneider, 1980 as cited in Levy & Zint, 2013). Based on their review of literature on political participation, Levy and Zint (2013) put forward a framework of hypothetical factors related to fostering environmental political engagement and participation. In this framework they included environmental internal and external political efficacy, which they did not further define. We interpret environmental internal political efficacy as an individual's confidence that they understand environmental politics and can contribute to environmental political action as a competent participant. Likewise, it can be inferred that environmental external political efficacy is the individual's belief that they can influence political decisions concerning the environment.

From the above, it is clear that the confidence needed for people to take action involves two features of self-efficacy. One feature is the confidence of being capable to perform an

action, which is related to Bandura's (2001) capacity expectations. The second feature concerns the confidence that the action, once performed, will produce the desired effect, which draws from Bandura's (1997) outcome expectancy.

Based on what we have now established concerning the sub-concepts of AC, we propose to (re)define the action competent individual as shown in Figure 3. Someone is action competent when they are committed and passionate about solving a societal issue, have the relevant knowledge about the issue at stake as well as about democratic processes, take a critical but positive stance toward different ways for solving it, and have confidence in their own skills and capacities for changing the conditions for the better.

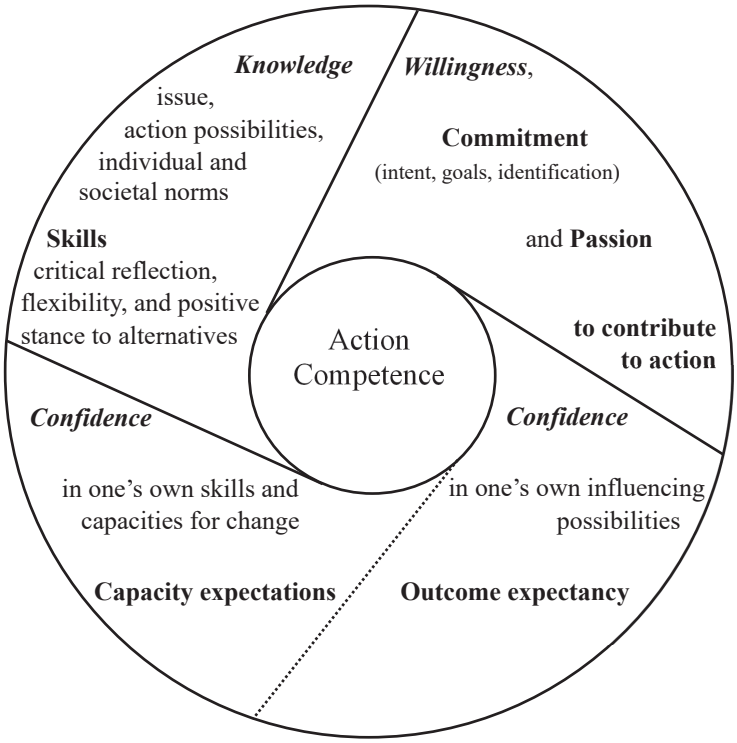


Figure 3. Core features for an action competent individual as generically redefined in this study

Action Competence and the Case of Sustainable Development

We will now discuss AC in relation to a specific issue, i.e. SD. As the issue at stake is related to SD, we propose to refer to the competence as Action Competence in Sustainable Development (ACiSD). Because AC gains specificity through the specific issue to be solved (Mogensen & Schnack, 2010), the question is then what commitment, passion, knowledge,

skills and self-efficacy are required for this type of AC to occur. In what follows, we will describe how we propose to interpret a specific form of AC (ACiSD) through our newly introduced generic definition of AC.

When considering ACiSD, the action is targeted at solving an SD issue. We understand SD as a process in which socio-cultural, environmental, and socio-economic perspectives are integrated and mutually interact (UN, 2015). We also consider the peace and partnership aspects that were additionally inscribed in the 17 Sustainable Development Goals (SDGs; UN, 2015). SD problems are controversial in that they are often characterised by opposing interests. As such, they comply with the kind of problem that action typically aims to solve (Breiting et al., 2009; Hungerford & Volk ,1990; Jensen, 2000). In line with our definition, action competent people are not only committed to and passionate about engaging in solving an SD issue. They also wish to take responsibility for themselves as well as for others. This involves a willingness to explain their point of view and the action(s) they decide to take. Considering SD issues and their possible solutions, this means that standpoints have to be made clear on which interests prevail and why in a certain set of circumstances. In other words, action competent agents are willing to make explicit *which* dimensions of SD are targeted, *how* that affects other aspects, and *why* they give preference to the interests of one dimension over another. This implies that these individuals are able to acquire and construct a coherent knowledge base on the SD issue at stake, including knowledge about origin, cause, effect, and stakeholders. Given the interrelatedness inherent in SD issues (UN, 2015), this requires systems thinking competence from the agent(s), which allows them to detect how change in one dimension (has) influenced and may influence the others (Wiek, Withycombe, & Redman, 2011; Wiek, Withycombe, Redman, & Mills, 2011b; Wiek et al., 2015). They also need to have knowledge of democratic environmental political decision-making processes, and visionary and critical thinking skills. Envisaging the future allows individuals to create a vision of the future as it may emerge if nothing changes and compare that to a vision of a more sustainable future that would result from their action for sustainability.

Because SD issues affect communities - local, regional or global - solutions often ask for collaboration at a smaller or larger scale. This collaborative aspect requires people skills, i.e. the skills needed to communicate to and collaborate with others. However, it also offers possibilities for reflection on differences between cultures and periods of time concerning finding solutions to SD issues and the norms that underly the choices involved (Mogensen & Schnack, 2010; Wiek et al., 2011). A critical reflection on different personal and cultural perspectives, may enhance creativity and broaden knowledge of action possibilities. Moreover, (international) collaboration may make up for competences that are problematic on an individual (or local) level. A competence that one person or community is missing, can be found in another participant in collaborative action. Here, we seem to detect opportunities that arise from the global dimension of certain SD issues such as climate change.

Looking at recent developments in the school-strike actions of high school students that have gone international, the global dimension that is often perceived as highly problematic, may also offer opportunities for broadening the agents' perspectives. This involves being willing to compare personal (cultural) standards and norms to those of other people(s) and cultures in order to adjust (collective and personal) choices for action towards solving SD issues. Moreover, this may add an aspect of optimism and creativity to the critical stance of the action competent agent, when students learn to be empathetic and respectful towards other ways of thinking. Thus, they can gain an "optimistic vision of potential" (Mogensen & Schnack, 2010, p. 71). As a group, people may feel more capable of finding solutions to SD issues. This can, in turn, enhance their feelings of personal self-efficacy (Chawla & Flanders Cushing, 2007) when facing the complexity of solving SD issues.

In sum, ACiSD consists of a balanced combination of personal and interpersonal competences. The personal competences entail a passion for SD, a commitment to finding solutions, knowledge about the SD issue and action possibilities, a holistic understanding of SD (systems thinking), visionary and critical thinking, and a positive feeling of personal capability and possibilities for exerting influence. Interpersonal competences add a willingness to provide arguments for the choices suggested, openness to other people's and cultures' perspectives, communication skills that enable collaboration, and confidence in the capability of the team and in the effects of collective pro-SD action.

Concluding Remarks, Discussion, and Suggestions for Further Research

This paper aimed to further explore the sub-concepts of AC. The sub-concepts willingness, knowledge, skills, and confidence in one's own influencing possibilities (e.g. Breiting et al., 2009) were further conceptualised. We redefined willingness as the commitment to and passion for solving an issue. This involves acquiring the relevant knowledge about the issue as well as about democratic processes (knowledge), and taking a critical but positive stance towards different ways for solving it (skills). Also confidence is required for AC. People do not only need to feel confident in their own influencing possibilities, but also in their personal and collective capacities for changing conditions for the better. Moreover, we distinguished between AC as an individual/collective competence of people and an educational approach. We have argued for interpreting AC as a generic competence of people and have referred to ESD as an approach that aims at fostering AC. Answering Jensen and Schnack's (2006) call for further investigation on how AC relates to different domains, we have discussed the concept in the context of SD. Thus, we have introduced the concept of Action Competence in Sustainable Development (ACiSD) when discussing AC as an individual or collective competence of people focused on solving SD issues.

We have further argued that ESD can be considered a subjectification model of education, because it aims at providing students with the experiences needed to become self-reliant,

well-informed decision makers. Consequently, ESD is directed at supporting students in developing the necessary ACiSD, i.e. the commitment, passion, knowledge, and self-efficacy for taking part in solving SD issues. However, the socialisation process lies in the introduction into a democratic society that welcomes active and optimistic citizens. Ideland (2016) cautions for an exclusion of the apathetic, pessimistic 'other', which is inherent in this socialisation process. Still, Hasslöf and Malmberg (2015) warn against a purely fact-based approach to ESD 'for fear of indoctrination' (p. 240). The complexity of the issues at stake and the speed with which new knowledge is created, may indeed argue against such an approach. In line with the pluralistic stance inherent in the concept of ESD, however, future research on AC may warrant focusing on a wider variety of cultural settings. Meanwhile, being explicit in mentioning the premise of valuing a rationale based on scientific reasoning, may meet this preoccupation.

Another concern to be addressed is the overwhelming set of skills and competences the 'super human' action competent individual should exhibit. Wiek and colleagues (2011) see solace for this in considering this at a collective level. When the necessary competences are available in the group, not every member needs to possess all qualities. On an individual level, it then suffices to find a balance between specialisation and generalisation, dependent on level of education (Wiek et al., 2011) and age. Further research may want to look into how AC emerges within children. In order to do so, we feel that research is needed on how AC can be operationalised with e.g. different age categories in mind. In this article we have outlined the conceptual ecology that underpins AC as a concept, and in further studies of AC this ecology of sub-concepts can be operationalised into research instruments developed for AC related to different controversial problems such as SD and health issues. In this paper we have exemplified AC in relation to SD. In line with this novel conceptualisation of AC, further research could investigate how the different dimensions of AC relate to each other. These efforts can now draw from our contribution to a further conceptualisation of the action competent person as:

someone who is committed and passionate about solving a societal issue, has the relevant knowledge about the issue at stake as well as about the democratic processes involved, takes a critical but positive stance towards different ways for solving it, and has confidence in their own skills and capacities for changing the conditions for the better.

Acknowledgements

The authors wish to thank all editors of *The Journal of Environmental Education* for their active and most constructive involvement with this paper. Their comments and feedback have proven to be of great value.

Chapter 3

Actions for sustainable development through early adolescents' eyes

Chapter 3

Young students have raised their voices in debates on what action for sustainable development (SD) is necessary. Nevertheless, research that gives voice to 10 to 13-year-olds while looking into SD issues in all their complexity of interrelated environmental, social, and socio-economic perspectives, is scarce. This study aims to give voice to these youngsters, asking them directly how they suggest they can contribute to SD. Building on the concepts of action and SD, this qualitative study reports on early adolescents' own suggestions for action. Participants suggested direct, indirect, individual, and collective actions both in the private and public sphere. Their actions targeted SD issues with interconnections between areas concerning the planet, peace, people, partnership, and to some extent also prosperity. We compare our results with findings of earlier studies to further the discussion on how young people feel they can and want to contribute to SD.

This chapter is based on Sass, W., Quintelier, A., Boeve-de Pauw, J., De Maeyer,S., Gericke, N., & Van Petegem, P. (2021): Actions for sustainable development through young students' eyes. Environmental Education Research. doi: 10.1080/13504622.2020.1842331

Actions for sustainable development through early adolescents' eyes

"Regardless of people saying we are too young or lack experience,
I think it is important to raise our voices against injustice,
no matter how small or great it is."

Amir Bachrouri (18, Belgium, interview with Fairtrade Belgium, 2021)
translation by the author

Introduction

> *"The past few years I went to the beach with my mum and dad. And then I saw a lot of dirt. And I wanted to do something about it, but I didn't know how. And now I got the opportunity to explain this."* (11-year-old girl)

In 2015, the United Nations described 17 Sustainable Development Goals (SDGs), targeting issues such as poverty, inequality, the right to decent jobs and quality education, and climate action. Sparked by underage climate activists from across the globe, such as Greta Thunberg, Autumn Peltier, and Ayakha Melithafa, who recently addressed the World Economic Forum Annual Meeting (World Economic Forum, 2020), young students are raising their voices, wanting to be heard on sustainability issues. With their weekly school-climate strikes that urge politicians to get informed by knowledgeable scientists and to implement measures for mitigating climate change, they are drawing attention to the current risks we are facing globally (for coverage see e.g. The Guardian on 24 May 2019). Getting involved in similar actions, sometimes within the boundaries of their schools and local communities, 10 to 13-year-olds added their voices to this growing choir. This illustrates findings that the function of role models shifts from parents to peers at this age (Smetana et al., 2006). These young activists' calls for action concur with several scholars' view that education should foster action in times when the natural world is at risk (e.g. Chawla, 2009; Kumler, 2011). *Action* is behaviour decided upon by who acts, and induces change or contributes to solving problems (Jensen, 2000) or issues. The latter are problems that incite controversy when possible solutions are discussed (Hungerford & Volk, 1990). Since sustainable development (SD) is a process in which interests of a socio-cultural, environmental, and socio-economic nature are interlinked or even in conflict (UN, 2015), SD issues are examples of such controversial problems (Sass et al., 2020).

Research has focused on environmental actions to be carried out by young students, such as switching off lights, recycling (Cincera & Krajhanzl, 2013), or social actions, such as doing something "to help poor people" (Gericke et al., 2019). SD actions put forward in research are initially drawn from the literature. Students are then consulted in the validation process. As Cincera and Krajhanzl (2013) suggest, youth may not have been given enough opportunity for independent participation in complex problem-solving tasks. Studies that offer more ample room for participating students' views and engagement, focus on environmental problems and climate issues (e.g. Connell, Fien, Lee, Sykes, & Yenken, 1999; Connell, Fien, Sykes, & Yenken, 1998/2014; Fisher, 2016; Kumler, 2010; Strandbu & Skogen, 2000), environmental behavior and pro-environmental consumption (e.g. Cincera & Krajhanzl, 2013; Erdogan, Ok, & Marcinkowski, 2012), political activism (e.g. Soler-i-Martí, 2015), or social issues such as global justice (e.g. Juris & Pleyers, 2009) and human rights

(e.g. Činčera et al., 2018). These studies provide valuable insights into specific isolated aspects connected to but not covering the complexity of SD issues. Studies interested in the complex phenomenon of SD in its entirety, with its interconnectivity between environmental, socio-cultural, and socio-economic perspectives, are facing a challenging task. Those that take on this challenge start from an adult point of view based on SD literature (e.g. Gericke et al. 2019). Others focus on locally embedded problems (e.g. Baptista, Reis, & de Andrade, 2018), and are interested in older (e.g. Connell et al., 1999; Connell et al., 2014; Kumler, 2010; Strandbu & Skogen, 2000), or younger students (Baptista et al., 2018; Cincera et al., 2017). In sum, studies that take on the challenge to research actions covering the complexity of SD, study younger or older participants, or take an adult perspective. Since we are interested in young students' own perspectives on SD action, we want to capture how 10 to 13-year-olds themselves imagine they can contribute to SD in all its complexity. We are especially interested in 10 to 13-year-olds because civic involvement is shaped in childhood, while social reference shifts from parents to peers at this age (Smetana et al., 2006). The current study wants to explore what actions for SD these students suggest they can carry out.

Theoretical Background

Acknowledging the challenges we are facing globally, the UN called for action in order to find sustainable solutions to environmental, economic, and social problems without compromising future generations' wellbeing (UN, 2015). As solving SD issues involves action (Chawla, 2009; UN, 2015), this concept is central in our study. In what follows, we first define *action* and *sustainable development issues*, before discussing some *studies regarding SD actions,* and outlining this study's central research questions.

Action

We first define the concept of action, including different types of action, and the spheres in which they may occur. Secondly, we discuss inaction, i.e. the (apparent) absence of action.

Action is a behaviour decided upon by who acts (Jensen, 2000). Moreover, it is targeted at solving an issue (Hungerford & Volk, 1990; Jensen, 2000), which is a problem that incites controversy on how to solve it. Drawing from the work of the original authors of the concept of action (e.g. Breiting & Mogensen, 1999; Jensen, 2000) we distinguish between direct, indirect, individual, and collective actions. As these actions can be performed in the private and public sphere (ENEC, 2018), we also focus on these contexts in this section.

Direct actions involve a direct contribution to solving an issue by the actor, whereas *indirect actions* seek to make others contribute (Bandura, 2001; Jensen and Schnack, 2006). So, when climate activists go on a school strike, they are performing an indirect action aiming

to make politicians take adequate climate measures. When politicians consequently (fail to) implement an agenda to mitigate climate change, they take direct action (Sass et al., 2020). Other examples of direct action are behaviours such as recycling, treating others respectfully, and helping "poor people" (Gericke et al., 2019).

Individual action has individuals performing a behaviour that is directed toward a goal they selected by themselves. Conversely, *collective action* involves a voluntary behaviour of a group of people, aimed at a common goal (Clark, 2016). Consequently, collective action involves collective decision making regarding goals and behaviour. Levy and Zint (2013) state that issues which emerge on a large scale (e.g. environmental issues on a global scale) require collective action. Likewise, youngsters taking action for human rights favoured collective action (Činčera et al., 2018), and also Ojala (2012) found evidence for collective problem-focused coping when investigating youngsters' coping strategies concerning climate change.

Another aspect of action is the *sphere* in which it is taken. This sphere can be *private* or *public* (ENEC, 2018). There is no consensus on what behaviour is private or public. Some scholars view recycling or sustainable consumption as private actions, whereas others place them in the sphere of citizen's duties (Melo-Escrihuela, 2008; Soler-i-Martí, 2015). Hobson (2013) views actions in the private sphere as the lifestyle choices people make in the context of their private lives, whereas public actions involve behaviour performed in their capacity of citizens. Likewise, Liobikiene and Simas Poskus (2019) posit that the consumption of personal and household products (buying, using, and disposing) belong to the private sphere. Conversely, civic actions such as petitioning, joining groups, and policy support occur in the public sphere (Liobikiene and Simas Poskus, 2019; Stern, 2000). In line with Stern (2000), and Liobikiene and Simas Poskus (2019), we understand private-sphere actions as resulting from personal choices concerning early adolescents' lifestyle and private life. Public-sphere actions are civic actions. Consequently, they are set in society, involving behaviour of youngsters in their capacity of citizens.

Up to this point, we have focused on action taking. Still, individuals can also decide to refrain from taking action. In her analysis of five texts regarding education that aims at fostering action competent children, Ideland (2016) problematises the view that opting for *inaction* should merely be perceived as undesirable. She found that action-competent individuals are defined as participating, empowered, empathic, optimistic, well-planned, and reasonable, whereas the inactive 'Other' is thought of as powerless, pessimistic, spontaneous, and possibly angry and/or despondent. These definitions are based on implicit cultural standards, which may lead to social reproduction in terms of race and social class (Ideland, 2016). Similarly, Strandbu and Skogen (2000) found a connection between cultural capital and environmental concern, but no relation with social class. However, in their study on youngsters' political participation, Henn and Foard (2014) found this was influenced by social class, educational history, and ethnicity. Thus, (in)action regarding

sustainable development issues may involve social inequality. Therefore, Ideland (2016) calls for caution in order not to exclude the inactive 'Other'. Moreover, Connell et al. (1999) found conflicting feelings of hope and pessimism when researching young Australians' environmental attitudes. Still, if given opportunities for action taking, this anxiety could be transformed into hope, as experiences gained through action enhances a sense of possibility. Thus, hope mitigates frustration and anxiety and helps develop a feeling of trust in one's own capacities for change (Ojala, 2016). This 'language of possibility' involves an openness towards finding inspiration in courses of action that have proven successful in other times, places, and cultures (Mogensen & Schnack, 2010, p. 71). This openness to different perspectives is in line with 'plurality' as explained by Arendt (1958), who saw the diversity between individuals in the past, present, or future as 'the condition of human action' (p. 8). However, also equality among men is important, as it allows 'to understand each other and those who came before them' or 'plan for the future and foresee the needs of those who will come after them' (Arendt, 1958, p. 175). By envisaging the future individuals create a vision of the future as it may emerge if nothing changes. When comparing that to a vision of a more sustainable future that would result from their action, they may find the hope that is needed for engaging in action (Connell et al., 1999; Jensen & Schnack, 2006; Ojala, 2016).

Sustainable development issues

Actions are targeted at solving controversial problems (Hungerford & Volk, 1990), and SD issues qualify as such (Sass et al., 2020). Although there is no consensus on how to define SD, much of the relevant research refers to definitions in UN policy documents (Barrella, Spratto, Pappas, & Nagel, 2018). In 2015, the UN described SD issues as complex problems that combine interrelated aspects from different areas, the so-called 5Ps: people, planet, peace, prosperity, and partnership. The area of *people* involves issues such as poverty, hunger, dignity, and equality. *Planet* concerns risks of ecological degradation and climate change, and consumption-production models that support present and future generations' needs. *Peace* regards peaceful, just, and inclusive societies, while *prosperity* focuses on economic, social and technological progress in harmony with nature. Finally, *partnership* emphasizes the need for solidarity and participation of all people and nations (UN, 2015, p. 2). Drawing from this definition of SD, we also consider these 5Ps as possible targets for action. By 'interrelated' we mean that action for SD can initially focus on any, but also on a combination of several of these areas. Moreover, dealing with one or a few of these areas, will often (intentionally or not) affect other areas as well. When students choose to go to school by bicycle instead of being taken by car for reasons of personal health (people), they are also reducing CO2 emission, which contributes to mitigating climate change (planet).

The UN (2015) also outlined 17 *sustainable development goals* (SDGs) action should be targeting. These goals cover, amongst others, intentions to end poverty, to provide good education for all, and to treat different genders as equal. But also care for the environment (on and offshore), the need for a sustainable economy, and the need for more sustainable

production and consumption are incorporated. Consequently, the 5 Ps and 17 SDGs provide a useful framework for guiding action.

Studies regarding SD actions

In what follows we discuss studies that examined emerging kinds of action taking regarding environmental issues (Connell et al. 1999; Kumler, 2011), political activism (Juris & Pleyers, 2009), and the importance of emotions such as anxiety and hope in action taking (Ojala, 2016). Furthermore, we focus on studies that related one or several SD areas to SD as a whole (Berglund & Gericke, 2018), or focused on the connection between the area of planet with other SD areas (Baptista et al., 2018). We will compare our findings to evidence found in these previous studies in the discussion section.

Connell and colleagues (1999) explored 16 and 17-year-olds' priorities, ideas, and concerns regarding *environmental problems*. They gave the participants the opportunity to use their own words to explain what causes and possible solutions they saw, as well as how they assessed their own ability to care for the environment. The youngsters' concern often did not lead to action due to paralysing feelings of frustration. While few of them mentioned how they could contribute through changes in their own life style that went beyond individual behaviours such as recycling, they sought possible solutions in increasing awareness and educating others. Still, the majority of them looked at the authorities rather than seeing a role for themselves in this. However, contrary to findings within social studies students by Kumler (2011) they did not seem to see solace in civic actions (i.e. actions in the public sphere) such as signing petitions to promote government action. Kumler (2011) discovered that the same environmental education course had different effects when taught in social studies than in science courses. After the course, students in social studies showed more diverse knowledge of action possibilities than did students in the science classes. In line with findings by Connell et al. (2014) and Ojala (2012), students mentioned individual actions more than collective actions, although they reported they would find it easier to take action when others would too (Kumler, 2011). This is in contrast with evidence found by Juris and Pleyers (2009) who described alter-activism as a form of young people's *justice activism* that is highly globalised, profoundly networked, open, collaborative, and deeply shaped by new technologies. Here, we see the need for collective action when targeting global issues, which was also suggested in Levy and Zint's (2013) study on environmental political participation. Another aspect that may enhance trust in one's own action possibilities is hope (Ojala, 2016). While pointing to the need to acknowledge *feelings of anxiety and worry*, Ojala (2016) posits that hope would enhance action taking when it emerges through a capacity to envisage societal change towards a better future situation. This can be achieved by allowing different perspectives into the classroom (Ojala, 2016), providing opportunities for taking action, and thus for learning from experience (Connell et al., 2014; Ojala, 2016). Juris and Pleyers (2009) focused on young activists (aged 14 and older) who acted against influential economic organisations such as The World Trade Organization, the World Bank, and the International Monetary

Fund, and their impact on social justice. These youngsters connected economic power to global social injustice. However, in line with Connell et al. (2014), whose evidence showed that the youngsters did not share a common understanding of the concept of SD, Berglund and Gericke (2018) found that Swedish 18 to 19-year-olds also lacked a clear understanding of economic concepts such as economic growth, economic development, and their effects on SD. They also concluded that some participants interpreted SD more narrowly as concerning environmental issues, while others saw the *connections between environmental, economic, and social dimensions of SD*. When aware of the interconnectivity of these different SD areas, students either focused on the challenge to integrate, or emphasised the conflicting positions of those SD dimensions. Another study that examined SD as *integrating the areas of planet, prosperity, and people*, is Baptista et al.'s (2018) research into what collective action 8 to 10-year-olds would be capable of concerning the issue of decreasing honey production in Portugal. They also found a strong preference for collective action. Moreover, the children were made aware of the interconnectivity between environmental issues, such as a decrease of the bee population, and socio-economic consequences for honey producers and their families. Students saw the need for change and showed an appetite for taking (collective) action in order to make this change occur (Baptista et al., 2018).

Aim and Research Questions

The studies described above all accepted the challenge either to investigate what actions young people (aged 8 to 10, or 14 and older) are willing to take, or how they understand SD. In this, early adolescents (aged 10 to 13) were underrepresented. Still, it is at this phase in life that individuals start looking to their peers for role models, rather than to their parents the way they used to in childhood. Moreover, their appetite for engaging in civic action in adult life is developed during early adolescence (Smetana et al., 2006). It is for these reasons that the current study aims to add their voices. This article reports on research that wants to complement existing studies on SD by finding out how 10 to 13-year-olds suggest they can take action for SD, and to what SD issues they want to contribute. Based on the literature, this study draws from the concepts of action and SD. The following research question is central in the current study:

> How do young students (aged 10 to 13) suggest they can contribute to sustainable development (SD)?

For answering this question, two sub-questions guided our research:

1. What SD actions do 10 to 13-year-olds suggest (direct/indirect, individual/collective, in the public or private sphere)?
2. At what SD issues (planet, people, peace, prosperity, and partnership) are the actions proposed by 10 to 13-year-olds targeted?

Methods

Our study was conducted in Flanders, the Dutch-speaking community in the north of Belgium. Embracing the idea of multiple realities, we wanted to give a wide variety of young students a voice, asking them directly how they thought they could contribute to SD. Thus, we aimed to report on early adolescents' different perspectives on action for SD (Creswell, 2007; Creswell & Poth, 2018).

Participants and procedures

As shown in Table 2, the current study included 75 students between 10 and 14 years old (*mean* = 12.5) in four class groups across three schools. Among them were youngsters in primary and secondary school, with different roots (ten different countries of birth, thirteen different home languages), 40% were boys, 52% girls, and 8% did not disclose their gender.

Table 2. Description of sample

n		75
Age	min.	10
	mean	12.5
	max.	14
Gender (%)		
	male	40%
	female	52%
	undisclosed	8%
Different countries of birth		10
Different languages spoken at home		13 69% Dutch including regional dialects; 12% multilingual; 16% speakers of other languages; 3% undisclosed

Prior to any research activities with the students, we informed parents and participants about our aims, research questions, and in what activities the teens would be asked to participate. Since the research activities coincided with the schools' learning goals that include themes such as the environment, the United Nations, and poverty, all students took part in them, but the research data were only registered when both a parent/responsible adult and the participant had actively consented. This was in line with the ethical guidelines of the authors' institution.

Wanting to stay close to the participants' daily reality, we chose to conduct our study in the classroom and integrate the research activities in the schools' teaching. Being a former secondary school teacher, the first author worked with the participants in their classroom settings in three sessions. Each session took two class periods, i.e. 100 minutes. The sessions were between one and ten days apart. The researcher used language the participants understood, and regularly verified mutual understanding between herself and the participants, as well as between the participants. The class teachers provided useful feedback that facilitated common understanding.

In line with Davies and Dodd's (2002) suggestion to create an atmosphere of mutual understanding and trust, the first session started with the researcher introducing herself as a former teacher, now researcher in social sciences. The students were also given the opportunity to ask questions and share things about themselves if they wanted to throughout this session. No recordings were made yet, because we did not want to distract or intimidate the participants.

In a second step, a warm-up activity introduced the concept of pluralism, which means that a problem can be viewed from different perspectives (Ojala, 2016; Rudsberg & Öhman, 2010). This methodological step was necessary to create an open atmosphere through which all students were assured that every of their suggestions and opinions was valued by all present, so the research would secure and include a rich diversity of actions. The group was given statements that gradually moved from e.g. random preferences for certain food to things related to SD. For each statement the students expressed their agreement or disagreement. The resulting reality of different views on the same statements was visualised by a green and red web, connecting students that had (dis)agreed with consecutive statements by a red or green thread respectively. Students were asked whether they felt these different perspectives were problematic. For more details regarding the statements used in this activity we refer to Appendices 1 (English) and 2 (Dutch).

In a third step we worked up to a mutual understanding of SD as suggested by Connell et al. (2014). This was based on the 17 SDGs (UN, 2015) and put in language the students could understand. First the 17 SDGs were discussed in a class discussion to make sure that all participants understood what they referred to. Students were invited to explain them to each other. The researcher only interfered when the participants indicated they did not succeed in explaining themselves. Then they could match the SDGs to their icon (optional task). They could compare their solution with the posters that had been put up in the classroom (see first page of 'Worksheets' in Appendix). The "Go Goals!" boardgame helped

the participants to get a more concrete idea about the SDGs[3]. Finally, the researcher informed the students about what she wanted to learn from them, i.e. what they thought they could do for SD and what actions they wanted to perform to work toward their ideal world. Participants were asked to select the SDG they found most urgent and wanted to contribute to, but if they were concerned about something that they could not fit into any of the SDGs, they were encouraged to elaborate on that regardless. In the following steps, they were asked first to think of what 'their world' would look like if we would reach the goal they had selected, i.e. they were asked to 'envisage the future' (Connell et al., 1999; Ojala, 2016). Then, they could think about which steps were necessary in order to achieve what they had in mind. Finally, they were asked to describe what first step(s) they thought would be feasible for someone their age. They were encouraged to express how they proposed to act for SD in whichever way they felt comfortable with, and given the choice either to further develop their projects individually or collectively (in groups of up to four). Thus, we gave the young participants room for critical discussion as suggested by Connell et al. (1999, p. 108) and Ojala (2016, p. 51), and promoted development of hope for change as pointed out by Ojala (2016, p. 51). The materials used during this session can be found in Appendices 1 and 2 (see pages 2-5 of 'Worksheets'/'Werkbladen').

In a second session, the participants started working (individually or collectively) on their suggestions for actions and chose how they wanted to present them to the class. Meanwhile, the researcher gave them the opportunity to tell her about their work in progress. No recordings were made, yet, but field notes were kept after the session. After one period (50 minutes) during which the students could finish their presentations, the second period of the third session was devoted to their presentations, which were audio and video recorded. Interviews following immediately after the presentation, were unstructured, and aimed at helping students to describe their actions into more detail. They were conducted only when the participants seemed comfortable with it.

The students provided 30 presentations of SD actions, ranging from two to nineteen minutes, that were audio and video recorded unless participants or their parents had not consented to such registration prior to the time of presentation. The resulting recordings were transcribed verbatim, and these transcriptions were used for analyses in NVivo 12. The students' individual and collective written preparations (texts, drawings, mind maps,…), provided extra information along with the first author's field notes, and descriptions of the students' artwork and images shown during the presentations that were included in the transcripts. The short interviews immediately following the presentations were also included in the transcripts. Thus, the transcripts and field notes provided the

[3] The "Go Goals!" boardgame can freely be downloaded in different languages from https://go-goals.org/.

adult researchers with the students' own interpretations of their drawings and artwork, which guided further analyses.

Analyses

Informed by conceptualisations of action and SD as described above, a coding tree was developed along the types of action and areas of SD issues (i.e. 5 Ps). In line with previous research, we opted for action dimensions direct/indirect (e.g. Connell et al., 1999; Juris & Pleyers, 2009), individual/collective (Connell et al., 2014; ENEC, 2018; Kumler, 2011; Ojala, 2012), and private/public (Connell et al., 1999; ENEC, 2018; Kumler, 2011). In a first stage, the coding tree was critically discussed with a second researcher. Secondly, the two researchers collaborated to code seven random fragments (about 23% of all observations) and spent ample time validating and refining the analysis categories. Thirdly, in order to guarantee the reliability of the analyses, both researchers independently coded the remaining observations. For certain categories, the coders obtained a substantial intercoder agreement showing Cohen's kappa values between .61 and .80 (Landis & Koch, 1977), while other categories appeared to be more complex. For these categories, codes were discussed and coding decisions made by the two researchers together during analysis sessions until Cohen's kappas for each category (.68 for action, .76 for SD issues) minimally fitted a range from .61 to .73, which is considered sufficient agreement (Landis & Koch, 1977). This resulted in a Cohen's kappa of .73 regarding the final coding tree, indicating sufficient reliability for further analysis (Landis & Koch, 1977). This calculation of intercoder agreement guided our discussions and further refinement of the concepts used for coding. We refer to Table A1 (in Appendix 1) for the general definitions of action categories and issues the actions were targeted at as used and finetuned by the two researchers during analyses.

Rigor was attained by making our research practices visible (Davies & Dodd, 2002) through verification and validation (Creswell & Poth, 2018). Verification included literature searches, bracketing past experiences, keeping field notes, sampling for diversity, identifying contrasting evidence, continuing data gathering until saturation, and peer reviewing. For validation we used multiple methods of data collection, i.e. observations described in field notes, and verbatim descriptions of oral presentations, short interviews, and drama, which included descriptions of drawings and art work shown during the presentations (Creswell & Poth, 2018).

Results

The current study focuses on capturing young students' suggestions of SD actions. Results are discussed focusing on action (RQ1), and issues (RQ2).

Action

As can be inferred from the overview in Table 3, putting the students' suggested actions into categories was not always straightforward. We realised that categories such as direct-indirect, individual-collective, and public or private sphere may be dynamic rather than a static given. The more the actions were thought through and elaborated upon, or the more complex, the richer they were in terms of categories of actions that were incorporated.

Table 3. Overview of different actions suggested by young participants with relative quantities per action category (direct/indirect/mixed; individual/collective/mixed; private/public/mixed) as analysed by the researchers

Actions suggested	Action				Sphere	
	Direct	**Indirect**	**Individual**	**Collective**	**Private**	**Public**
	42.8%	47.6%	52.4%	28.6%	14.3%	66.7%
	9.6% mixed		19% mixed		19% mixed	
Donating clothes to the needy	X		X			X
Helping homeless find shelter	X		X			X
Organising activities for promoting gender equality	X		X			X
Using eco-friendly transport, saving resources	X		X		X	
Buying fair-trade products	X		X		X	
Boycotting products tested on animals	X		X		X	
Starting, supporting and/or cooperating with aid organisations	X			X		X
Raising and donating funds, food, or clothes to the needy	X			X		X

Asking authorities and nations for help or support		X		X		X
Raising and donating funds, food, or clothes to aid organisations		X		X		X
Organising a school event to inform the public about eco-friendly behaviour		X		X		X
Suggesting law creation and enforcement		X		X		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		X	X			X
Calling for a boycott of products tested on animals		X	X			X
Promoting eco-friendly behaviour		X	X		X	X
Collecting litter from streets, the sea,…	X		X	X	X	X
Informing acquaintances or the general public about aid organisations		X	X	X	X	X
Calling for action (on social media, by putting up posters, or	X	X	X	X		X

handing out flyers)						
Pay it forward	X	X	X	X	X	X

Both individual and collective actions were considered by the students, involving direct and indirect actions. What started as a direct action, such as opting for an eco-friendly means of transport, sometimes evolved towards an indirect action when a student's personal choice moved toward modelling/promoting the desired behaviour to others. When promoting desired behaviour, actions were presented as to be carried out in a hypothetical future as well as having been performed already:

> *"I think there should be equality between boys and girls in other countries, too. And I would organise something here at school and so on. And that would then also happen in other countries, equality between boys and girls." (11-year-old girl, individual presentation)*

Although this girl's action was presented as an individual direct action (spoken in first person singular; initially intended to directly treat boys and girls as equal herself), she hoped to model the desired behaviour, so that 'other countries' would follow her country's example of treating boys and girls as equal. We could consider this a direct action with implicit hopes to have indirect effects across nations. Still, she did not specify how 'other countries' would pick up on this. Other participants were more eager to put their ideas into practice:

> *"Participant 58: Yes, I have. I've put that on Instagram… and… [shrugs]*
>
> *Interviewer: Have you done that already?*
>
> *Participant 58: Yes, I have.*
>
> *Interviewer: What have you put on it then?*
>
> *Participant 58: You know… [shrugs]*
>
> *Participant 59: Boys and girls are equal."* (10-year-old girl and 11-year-old boy, interview following group presentation)

The same eagerness to get started was shown during the presentation of an elaborate well thought through action, when students invited classmates to help with preparing a collective action there and then:

> *"Participant 72: We now have a group task for you. We have, as you can see, a good sphere and a bad sphere. […] There's the good side, yes, bad's gonna start*

over there, and then I'm gonna give you a pen and then you can each draw one thing in the good sphere, and one thing in the bad sphere, and… but they've got to be useful things, you know. I'll take some pens now." [Classmates start working on two posters showing a bad and a good sphere for them to fill] (12-year-old girl, group presentation by two students)

Contrary to the action just described, which was construed as collective from the beginning, the 'pay-it-forward' action would start from individual actions of kindness to others. Still, the aim was for this individual and direct action to spark a movement of caring and helpfulness. Thus, what started as an individual direct action, would become indirect action, eventually evolving into collective action, i.e. the 'pay-it-forward' movement. Four 11-year-olds explained it thus:

"Hi, our plan's called World Peace. It's about collaborating with others. The concept is: we're each gonna help three other people, and instead of them thanking us, they're gonna help three other people again." (participants 25 to 28, 11-year-olds, gender undisclosed, group presentation)

When looking into the sphere in which actions were undertaken, the same action could be categorised as private as well as public, depending on the context information the participants provided. This occurred for example with the action of collecting litter. One group presented this as a possible activity when playing in the streets, whereas another team included asking for permission and logistic support from the town's mayor. This action was felt to be either a choice of which game to play with friends (private sphere), or a task of citizens (public sphere). Consequently, the same action, i.e. collecting litter in the streets, was presented as occurring in the private sphere by the former group, and in the public sphere by the latter. Still, in the play that was performed by the public sphere team, they were joined by a friend who saw them working:

"Participant 5: Hi girls, what are you doing?

Participants 6, 7 and 8 (together): We're collecting litter.

Participant 5: Can I help?

Participants 7 and 8: Sure…"

[All pick up litter with the equipment they got from the mayor.]
(four 10 and 11-year-old girls, drama, group work)

Here, the girl who joined the team while at work may have changed the sphere from public into private by stressing that they were all friends who enjoyed doing something together.

A minority of students seemed less eager to take action. One quiet 12-year-old limited the presentation of his 'world peace project' to describing his drawing of the New York Twin Towers. He explained that they represented a symbol of peace to him since they had been destroyed in the 9/11 terrorist attacks. To him, a drawing with an intact New York townscape referred to the pre-9/11 more peaceful world he felt had been lost and was anxious to get back. When other participants wanted to know how he imagined to contribute to achieving that level of safety again, he shrugged and said he would *"by just telling them to stop with wars"*. Previously, while making his drawing, he had told the adult researcher that he would really like to put a message for peace on the Internet, but that he *"most certainly"* was not going to do that. When asked why not, he answered *"because I'm afraid the terrorists will come and throw their bombs"* (conversation reconstructed from field notes). We will revisit this case in the discussion section.

In sum, categories of action were not always mutually exclusive: while some suggested actions were neatly presented as being (in)direct and individual or collective throughout, other actions could be placed into several categories. What started as a direct action could end up indirectly modelling desired behaviour, and individual actions sometimes evolved into collective actions or even worldwide movements. The same happened when similar suggested actions were described in either the public or private sphere, or when a certain action evolved from public to private.

SD Issues and the interconnectivity between them: Planet, People, Prosperity, Peace, and Partnership

In line with the definition of SD as discussed in the introduction, we present an overview of issues along the 5 Ps (UN, 2015), i.e. planet, people, prosperity, peace, and partnership. However, the area of partnership is of another nature than the other four areas. A description of partnership provides answers to the question of 'who with', whereas the other areas deal with the 'what' question. For this reason, we first discuss actions focusing on planet, people, prosperity, and peace issues, before addressing partnership. We refer to Table 4 for an overview of all categories of issues the suggested actions targeted.

Table 4. Overview of SD issues aimed at per action (implicitly mentioned aspects between brackets) as analysed by the researchers

Action	Planet	People	Prosperity	Peace	Partnership
Donating clothes to the needy (living in poverty or having fled war)		X			
Helping homeless find shelter		X			
Organising activities for promoting gender equality		X			

Performing and/or promoting eco-friendly behaviour (regarding choice of transport, saving resources, options for heating and lighting, reducing CO2 emission, waste, and littering)	X				(X)
Buying fair trade products		X			
Boycotting products tested on animals	X				
Starting, supporting and/or cooperating with aid organisations		X			X
Raising/collecting, and donating funds, equipment (e.g. boats), food, or clothes to the needy		X	(X)	X	
Asking authorities and nations for help or support					X
Raising and donating funds, food, or clothes to aid organisations		X			(X)
Creating opportunities for education, earning a life, and housing		X	X		
Organising a school event to inform/educate the public about how eco-friendly behaviour 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, neighbours,…)		X			(X)
Putting a message for peace on social media				X	
Calling for a boycott of products tested on animals	X				
Collecting litter from streets (also to prevent sea pollution)	X				
Informing acquaintances or the general public about aid organisations		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

Students often addressed the interconnectivity between the areas. When analysing the issues suggested actions were aimed at, the adult researchers often found it difficult to unravel this holistic view of SD issues. Therefore, we will discuss the results in a way we hope will do justice to the students' understanding of SD actions, presenting their interpretations of issues as they explained them during conversations, interviews, and presentations alongside the researchers'. One such case is that of action against testing (cosmetic) products on animals. When asked which area this action targeted, the participants indicated they saw this as a social concern (i.e. people). So, instead of categorising this action as a planet issue (as the adult researchers were inclined to do during analyses), they explained they saw (laboratory) animals as *"part of the family"* just like their pets. Therefore, actions for animal rights were felt to be of a social rather than an ecological nature (three girls aged 12 and 13, conversation during second session, reconstructed from field notes). However, this group's eco-centric view, pointing towards the rights of nature (i.e. laboratory animals), was complemented with an anthropocentric perspective by

others. They additionally highlighted the need to take care of the environment for human benefits:

> *"Participant 71: We try to cross as large a distance as possible by bicycle or electric car, but they should be charged in an eco-friendly way then of course.*
>
> *Participant 72: 'Cause if there are too many CO2 exhaust fumes, nature'll perish, and then there's no more place to live for the animals.*
>
> *Participant 71: But it's also better for humans, 'cause if there's less CO2 exhaust fumes, the air'll be healthier, and we'll be ill less, hopefully, get outdoors more often, 'cause the weather will be nicer, and then we won't have any more climate problems."* (two 12-year-old girls, group presentation)

Here, the two girls explicitly linked climate change to animals' rights to a place to live (planet, eco-centric) as well as to people's health and wellbeing (people, anthropocentric). From these examples, we can infer that concern about the planet was mentioned on its own behalf, as well as in function of human benefits.

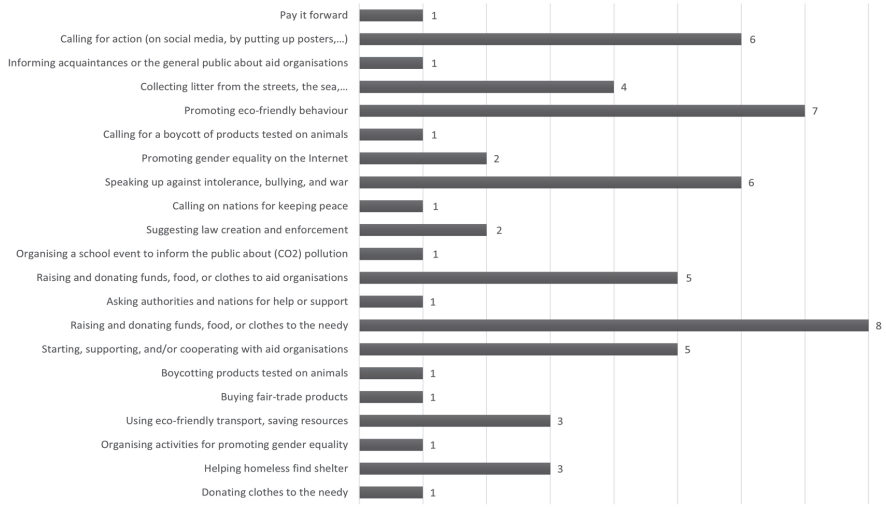


Figure 4. Frequency of actions mentioned by the young participants to the current study

When looking further into the area of people, poverty was frequently mentioned as a major concern as can be seen in Figure 4. For this issue, students saw various causes to be tackled. The main cause of poverty mentioned more often than not, was war. Through this war-poverty connection the students explicitly highlighted the interconnectivity between SD areas of peace and people. War was discussed as a global issue as well as a local one. On a

local scale it was compared to bullying and fighting instead of talking to each other. Two girls also reflected on the causes of war at a larger scale. They concluded that wars probably start because people who do not have a good life, are jealous of those who are better off:

> *"They throw bombs, they take Kalashnikovs, pistols and such, they make war, in fact. The others try to protect themselves, to protect their country, etcetera, and their family of course… and the others, they try to ruin their lives so they can have all the money they have."* (two girls aged 10 and 11, double interview)

So jealousy of other people's wealth, which can be viewed as (self-perceived relative) poverty, was seen as both a cause and a result of war. Again the association between areas people and peace was acknowledged by the students, but this time seeking to address not only the effect, but also the cause of a peace issue within the area of people. Other consequences of war, such as the demolition of homes, and the necessity to flee and risk one's life trying to reach safer ground, caught the students' attention as well. Next to preventing the problem of war at the roots, acting against fighting and bullying, also the consequences of war (such as relocation of people) and poverty due to other causes or reasons were themes that guided action. Still, with the exception of one 10-year-old boy who briefly mentioned *'too many taxes'* during his presentation, none of the participants explicitly discussed possible causes of poverty other than war. Furthermore, the need to provide education, clothing, and shelter was discussed both on a local and a global scale. The participants labelled the latter as poverty 'in other countries' or helping 'poor countries'. When tackling the problem locally as well as globally, actions consisted of providing food, clothes, housing/shelter, health care, education, and jobs:

> *"First, we're gonna buy food and clothes for the poor; establish a school for poor children who can't go to school; make sure everyone has a place to live; find a job for everyone, so they get paid well."* (four boys aged 11 and 12, group presentation)

Seeing the link between poverty as a lack of means, educational opportunities, and decent jobs, these students expressed their consciousness of the connection between people and prosperity. Others also reflected on which aid organisations best to support. In this, providing support that would empower the people(s) in need, rather than making them dependent on aid initiatives, were favoured by two girls aged 12 and 13:

"…[This aid organisation] helps farmers, donates animals so they can get out of poverty by themselves, so in poor countries there are poor farmers […]. And, yeah, you can send them food parcels, but then that becomes a habit. And what [this aid organisation] does, they send them animals or chickens. And they can then breed those cows and chickens further and they can help themselves out of poverty. So they can get out of poverty by themselves, then." (interview following group presentation)

Apart from recognising that education and *"getting a good job"* were necessary to overcome or prevent poverty, hardly any references were made that could be attributed to the area of prosperity. Still, the vicious circle from insufficient means (proficiency) to lack of opportunities for education, which would then result again in poverty (people), was described by a 10-year-old girl during an interview:

"Participant 1: … and if for instance you get a job, that costs a lot of money again, for instance police… [silence, hesitates]

Interviewer: What do you mean 'if you get a job'? Normally, if you get a job, you earn money, don't you?

Participant 1: yeah, but…

Interviewer: How come then that it costs money?

Participant 1: No, for example, you've got to go to school first, and so on,…

Interviewer: Ah, now I see what you mean…

Participant 1: That's what costs money… and they can't afford so much then."

This girl saw a link between a lack of means and reduced access to education, which would again lead to a continuation of life in poverty. As described above, jealousy of other people's wealth was seen as a cause of war, which would in turn lead to poverty again. Actions aiming to provide relief for poverty, were diverse. Some aimed to directly offer money, food, or shelter. Others wanted to empower people and nations so they would learn to fend for themselves. Here, education was viewed as a way to get a good livelihood, as well as a manner to avoid war or bullying. Figure 5 illustrates the interconnectivities

between SD areas that were mentioned by the students as analysed by the adult researchers. Actions aiming to provide relief for poverty, were diverse. Some aimed to directly offer money, food, or shelter. Others wanted to empower people and nations so they would learn to fend for themselves. Here, education was viewed as a way to get a good livelihood, as well as a manner to avoid war or bullying.

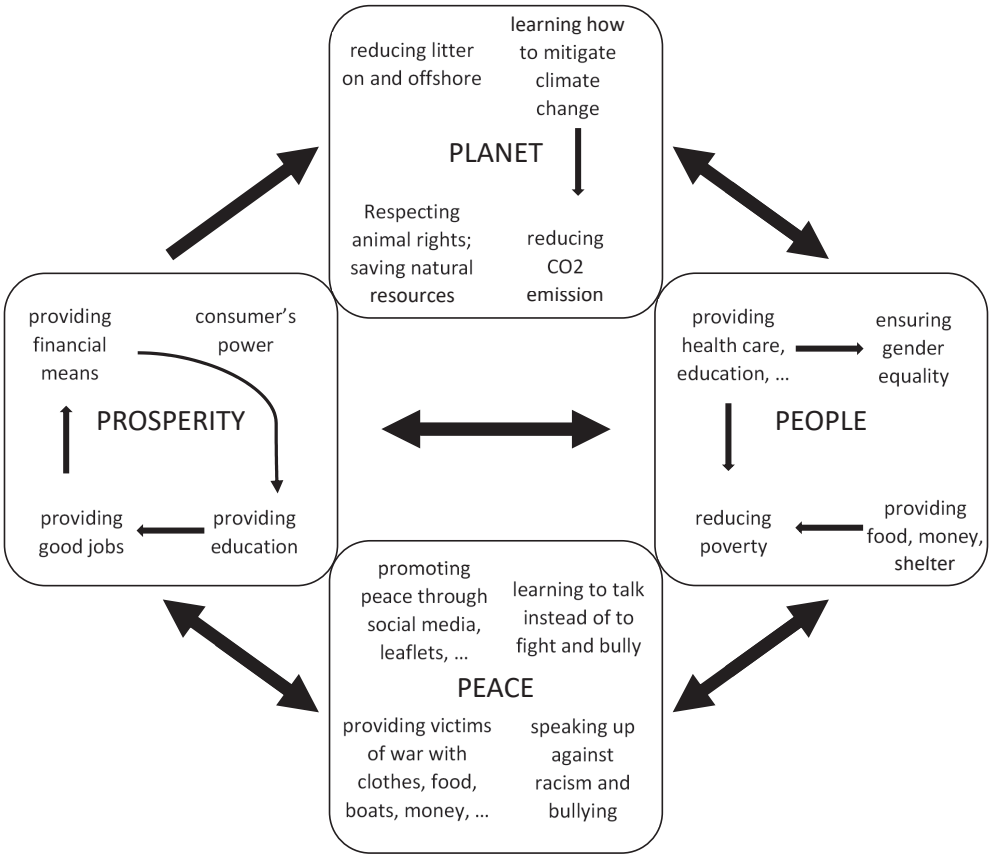


Figure 5. Interconnectivity of issues concerning areas of planet, people, peace, and prosperity as presented by the participants in the current study and analysed by the adult researchers.

As shown in Figure 5, Students did not mention planet issues as causes for reduced or enhanced prosperity, nor did they address any interconnectivity between planet and peace concerns. However, apart from these, all SD aspects were somehow seen as interconnected. They presented their own initiatives for education as a means to contribute to the planet aspect of SD, thus expressing how they associated the 'people' with the 'planet' aspect:

… for example, with the remaining money from group 1, we can make our own learning materials about environmental pollution for primary school."

(12-year-old girl)

Also reversely, the beneficial effect of reducing environmental pollution (planet) on people's health and wellbeing (people) were presented. As was illustrated earlier in this section, the association between 'people' and 'peace' was also addressed in both directions: helping people out of poverty was presented both as a way to avoid war (no cause for jealousy would reduce the risk of aggression) and as a way to reduce the consequences of war. Moreover, in the students' view, educating (people) on how to communicate peacefully through an anti-bullying action at school, would avoid the occurrence of war (peace) at a later stage in life. They also consciously sought to promote peace by providing an adequate livelihood, thus connecting prosperity to people and peace through partnership. This was illustrated in the Pay-it-forward action:

"… and thus we collaborate, in fact, working on different goals at the same time. And this is what we mean: we give someone a good life, and we make sure that they aren't hungry anymore. We make sure there isn't any poverty anymore, really, and that everyone works together, and this is the… this is how we create world peace." (four 11-year-olds, gender undisclosed, group presentation)

Vice versa, war was seen as a condition that may lead to a lack of education (due to insufficient financial means) and consequently opportunities for getting a good job, or the ability to rebuild damaged homes (prosperity). Moreover, participants underscored the connections between poverty, the need for education and gender equality (people), and opportunities for 'having a good life' (prosperity). Finally, they pointed towards their power as consumers (prosperity) as a means to fight 1) injustice by buying fair-trade products (people), and 2) breaches of animal rights (planet) by boycotting products tested on animals.

After this description of results pointing to the 'what' question, we now turn to the question concerning 'who with' (i.e. partnership). Participants suggested partnerships in two directions. They wanted to support existing initiatives by officials such as the mayor or

"all the bosses of all the countries" (four boys aged 11 and 12), and aid organisations. Conversely, they also sought collaboration for actions they would initiate themselves.

Organisations they wanted to support were sometimes defined generically as aid organisations. But other participants were specific in their preference for a particular organisation. Some knew precisely why they would favour one over another, as in the case of the girls who wanted to support an organisation that would empower instead of making communities dependent of aid provision. Next to organisations, also individuals were singled out for receiving help. Sometimes this support developed into a direct action, such as providing money, food, clothes, or shelter to individuals in need.

In other cases, the assistance of others was called for. Apart from joining strengths between peers, e.g. when collecting litter from the streets, also parents, especially mothers, were occasionally asked for information or assistance. This kind of cooperation covered practical assistance such as "*baking cookies"* that would then be sold to raise money (13-year-old girl). However, some students would also *"ask my mum"* for more elaborate practical support like providing a way "*to take all the money we've collected to life boats that can then go and collect the poor or get them out of their war situations."* (10-year-old boy, interview following individual presentation illustrated by a drawing)

Also the parents' networks were used to get *"stuff"* to people in need both locally and abroad:

> *"And then I'm going to give that to someone, 'cause my mum knows someone who gives that ['stuff'] to people."* (11-year-old girl, interview following individual presentation of billboard 'No Hunger' stating the purpose of a jumble sale)

In sum, partnerships were sought both to provide and seek support. Furthermore, organisations as well as individuals were mentioned at the receiving and giving ends. Individuals could be total strangers, but also family and friends. Finally, the partnerships included individuals, world leaders, networks, organisations, and nations.

Discussion and suggestions for further research

In our study, students suggested actions covering the full range of direct, indirect, individual, and collective actions in the private and the public sphere when dealing with SD issues. This is in contrast with findings by Ojala (2012) and actions used in the sustainability

consciousness study by Gericke et al. (2019) that both predominantly point at direct actions. Compared to Connell et al. (1999), participants in the current study more frequently showed confidence in their possibilities for enthusing others into taking action for SD by informing or educating the public, parents, neighbours, and friends (indirect actions). During the presentations as well as in conversations during sessions one and two, our participants spoke in the first person (both singular and plural), which may be indicative of a greater trust in their personal possibilities for inducing change than was found by Connell and colleagues (1999), who predominantly noted references to they, their, and them in their focus groups. Even when discussing issues regarding (global) peace, our participants considered actions possible on a local scale (e.g. speaking up against intolerance and bullying), as well as on a global scale (e.g. putting a message for peace on the Internet). In line with Connell et al. (1999) and Kumler (2011), however, using their power as consumers to promote environmental-friendly production was suggested as a feasible action in only one presentation by 7th graders. When looking at the frequencies with which actions were mentioned, a majority of participants to the current study opted for individual rather than collective actions. Still, our evidence included individual as well as collective actions, confirming findings by Baptista et al. (2018), Juris & Pleyers (2009), Kumler (2011), and Ojala (2012), who found evidence for young people's desire for collective action. Even though actions in both spheres were represented, our evidence pointed towards a preference for the public sphere. This may be due to the possible emphasis on private sphere actions such as anti-bullying campaigns, collecting litter, sorting waste, and saving resources in Flemish schools. Moreover, families are used to sorting their waste, since it is collected separately. Participants to our study may have sought inspiration for novel actions in the public rather than in the private sphere for this reason. They did not (always) make explicit whether they thought of the actions they suggested as direct/indirect, individual/collective, private or public. They only occasionally elaborated on their perception of SD issues as being predominantly planet, people, prosperity, partnership, or peace issues. Further research may want to shed more light on possible differences between early adolescents' and adults' understanding of these kinds of categories.

Although most participants were happy to communicate what action they saw as viable for their age, a few seemingly preferred inaction (e.g. the Twin Tower case). In this, we discern the importance of discussing possibly traumatising events (e.g. terrorist attacks) with students. Along with Ideland (2016), we advise against judging or excluding 'the passive other'. Moreover, we see merit in educators' efforts to find out about the source of this inactivity in order to provide possibilities for developing hope that change is possible. Nevertheless, we recommend valuing students' ambition for contributing to SD to the fullest.

Looking into the issues targeted, all 5 areas of SD (planet, people, peace, prosperity, partnership) were represented in the actions suggested in our study. Nevertheless,

prosperity was mentioned less explicitly and less often. Cook (2016) suggested that adolescents put faith in technological developments that would offer solutions to SD issues in the future. Our participants also referred to the use of new technologies (e.g. using renewable energy), which may imply a similar belief in technological development as was also found by Ojala (2012). Moreover, in line with Berglund and Gericke (2018), the younger students in our study, were aware of interconnectivities between the 5Ps (see Figure 5). They linked poverty (people) to war (peace) and vice versa, human-induced environmental problems (planet) to both animal and human wellbeing and health (planet, people), and saw having a decent job (prosperity) and opportunities for education (people) as a means for overcoming poverty (people). They also recognized that they, as consumers, could influence businesses and their manufacturing methods, thus linking their consumption options (prosperity) to animal welfare (planet). However, our participants did not mention connections between planet and peace (and vice versa), and between planet and prosperity. This may be due to a lack of direct effects of environmental issues on the participants' living conditions at the time of data collection, as contrary to Baptista et al. (2018), who linked local honey producers' incomes to environmental concern about reducing bee populations. This may confirm findings by Connell et al. (2014) that not being personally affected inhibits action. Therefore, further research may focus on communities that are facing the need for migration due to environmental or climate issues, in order to verify if early adolescents who live in such communities suggest actions that connect planet and peace, and/or planet and prosperity. Comparing evidence with the results of our study would provide information on whether personal living conditions and early adolescents' views on SD (actions) are linked.

We noticed that providing information and education emerged as recurrent themes across all areas. Students saw themselves both as needing and capable of providing education. In line with Ojala's (2012) findings, actions aimed for example to inform peers and adults about the need to adopt a pro-environmental lifestyle. Education was also seen as a vehicle to reduce poverty, promote equality, contribute to peace, and empower people. Further research may want to look more explicitly into the importance early adolescents attribute to education in the context of SD actions. Likewise, the diversity of sources that inspired the participants for designing their actions, caught our attention. Narratives found in feature films and documentaries, but also live role models and exemplar behaviour shown on (social) media seemed to enhance the students' creativity. Intervention programmes may benefit from further research into the sources of inspiration for SD actions. Finally, it would be interesting to find out to what extent early adolescents are also willing and capable to perform the suggested actions.

Implications and Conclusion

Our results showed that early adolescents suggest (in)direct, individual, and collective SD actions in the public and private sphere. These actions can be dynamic, moving from one

category and from one sphere to another. The actions covered different SD areas (planet, people, peace, prosperity, and partnership) and included interconnections between certain areas. Therefore, when designing educational programmes, we would caution for underestimating the richness and level of complexity of actions early adolescents' feel they are capable of and willing to take, while acknowledging their need for collective action and collaboration with peers as well as with existing organisations. Giving room for autonomy and exploration may enhance their creative capacities and enthusiasm for contributing to SD.

Our study revealed that early adolescents see a rich variety of SD actions as feasible for someone their age, and that they are aware of the interconnectivity between different SD areas.

Acknowledgements

The authors are indebted to the young participants in this study for their inspiring cooperation and to their teachers for their much valued support. For their assistance with the transcriptions of the audio files we thank Rosanne Van de Vijver and Kobe De Maeyer.

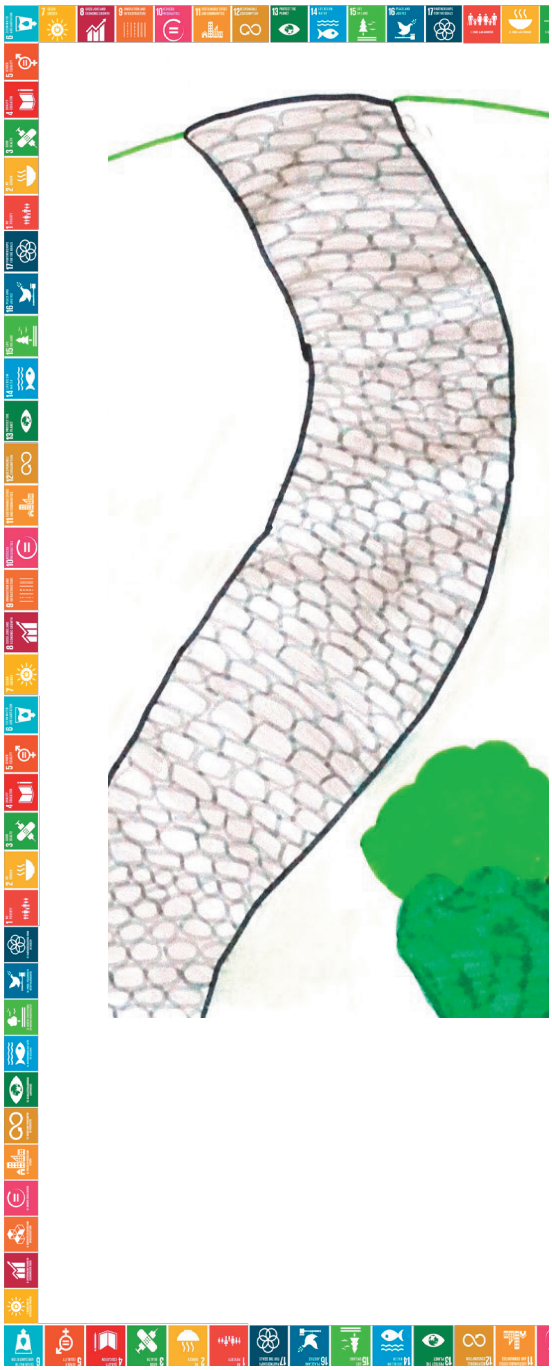
Chapter 4

Development and validation of the action competence in sustainable development questionnaire (ACiSD-Q)

Chapter 4

Action competence consists of the knowledge, willingness, and self-efficacy for contributing to a controversial issue such as sustainable development. Action competence in sustainable development (ACiSD) is a desired outcome of education for sustainable development (ESD). Still, the scarce instruments for measuring ACiSD, are not specifically designed for early adolescence. We here report on the development of such a measurement instrument: the ACiSD-Q, using a mixed-method approach. After a literature review, early adolescents informed the generation of an initial item pool. Assessment of the scale's content validity preceded a first test of psychometric properties. Finally, rigorous statistical analyses confirmed the proposed structure, reliability, construct, and predictive validity of the final ACiSD-Q. We present a valid and reliable instrument for monitoring ESD efforts aiming to enhance students' ACiSD.

This chapter is based on Sass, W., Boeve-de Pauw, J., De Maeyer, S., & Van Petegem, P. (2021): 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). Environmental Education Research, 27(9), 1284-1304. doi: 10.1080/13504622.2021.1888887



Development and validation of the action competence in sustainable development questionnaire (ACiSD-Q)

"Climate change is the culmination of every injustice and social system that is set up. It is not just one issue that exists today. If I care about gun violence, if I care about women's rights, if I care about health care, if I care about education, if I care about immigration, if I care about anything, I care about the climate."

Elsa Mengitsu (18, North Carolina USA, at Health Action Conference 2020)

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, 2020). Consequently, it does not suffice for education merely to transmit knowledge, skills, and attitudes for learners to reproduce (Eames et al., 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., 2020). The United Nations (2015) proposed 17 *sustainable development* goals (SDGs) aimed at working towards 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 programmes need a *measurement instrument* to monitor learning outcomes, i.e. ACiSD (Sass et al., 2020). Operationalising a wickedly complex concept such as ACiSD is a challenging task (Berglund, Gericke, & Rundgren, 2014). Instruments measuring motivation for pro-environmental behaviour 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 et al., 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 et al., 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 programmes 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).

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., 2020).

As such, action competence in sustainable development (ACiSD) is a complex concept that is composed of different sub-concepts. In what follows we will describe these sub-concepts before outlining the overall structure of ACiSD. Thus we will briefly zoom in on sub-concepts 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., 2020).

Stern (2000) called for defining (environmentally significant) behaviour as intent-oriented with a focus on sub-concepts such as beliefs and motives. The behaviours 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 behaviour 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 fair-trade 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 et al., 2009; Jensen, 2000; Jensen & Schnack, 2006; Sass et al., 2020). 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 sub-concepts, or SD areas in this case (Anderson & Krathwohl, 2001). The area of planet focuses on risks of ecological degradation and climate change, and favours 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 favour 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., 2020; 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., 2020).

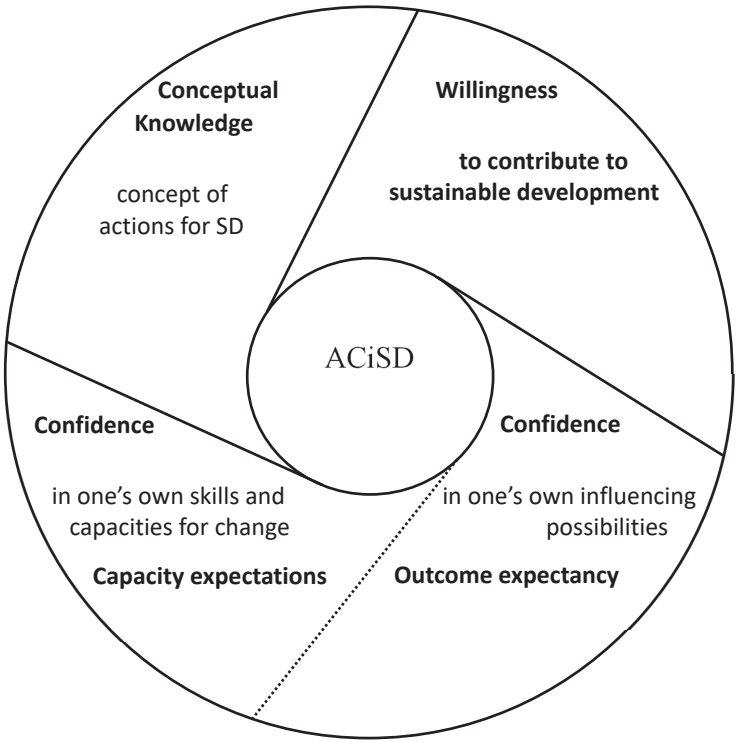


Figure 6. Core features of ACiSD (after Sass et al., 2020)

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 6.

Analytical Procedures

Table 5. 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)

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 and Schnack's seminal work (2010) and Sass et al. (2020). 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 5.

In the first step, Sass et al.'s (2020) 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. (2020).

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, Quintelier, et al., 2021). A selection of 11 initial items resulted from this pre-study.

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 centre, which is a widely used and powerful response scale if the items are phrased in clear terms (Cohen, Manion, & Morrison, 2011; DeVellis, 2017).

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).

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 feasible for someone their age in order to generate an initial item pool of age-appropriate SD issues and actions.

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-centred, 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 audio-visual materials shared during the presentations.

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 feasible for someone their age. Informed by a conceptualisation 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).

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 A2 (in Appendix 3), 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 6.

Table 6. 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	… organise a jumble sale 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 I don't use any more to people that live in poverty here with us.
	W8	… organise 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 I 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 I don't use any more to people that live in poverty here with us.
	CE8	… organise a jumble sale 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 I 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 I don't use any more to people that live in poverty here with us.
	OE8	… organise 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 I don't use any more to people who have fled from war.

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 6). 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.

Sample and procedure

Firstly, 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). Secondly, a ten-year-old boy and girl filled the questionnaire while thinking aloud, which is a cognitive pre-test 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).

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.

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 7 for an overview of all rephrased items.

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 sub-concepts of conceptual knowledge, willingness, capacity expectations, and outcome expectancy.

Table 7. 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.

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 6), 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).

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.

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 behaviour, 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 sum scores for each of these subconstructs. Based on the theory on action competence as outlined in the

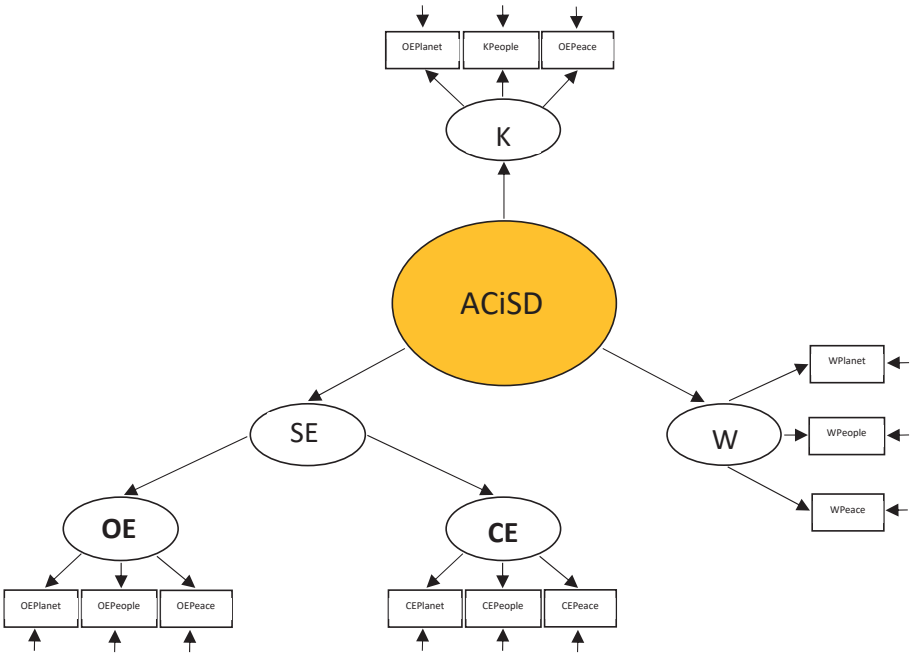


Figure 7. Theorised three-order model of Action Competence in Sustainable Development (ACiSD) constructs. The model consists of latent variables self-efficacy (SE), conceptual knowledge (K), and willingness (W). Self-efficacy consists of two subconstructs, i.e. capacity expectations (CE) and outcome expectancy (OE). The first-order variables consist of items categorized into environmental (Planet), social (People), or peace aspects of sustainable development.

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 7).

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 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 behaviour 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-behaviour measurement to assess correlations between the latent constructs of the ACiSD, Utilization and Preservation (2-MEV), and SCQ-S-behaviour. 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 towards 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 behaviour* 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 Behaviour constructs of the SCQ-S. Conversely, we expected to find no correlations with 2-MEV's Utilization scale.

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 sum scores 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 theorised model (see Figure 7). 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.

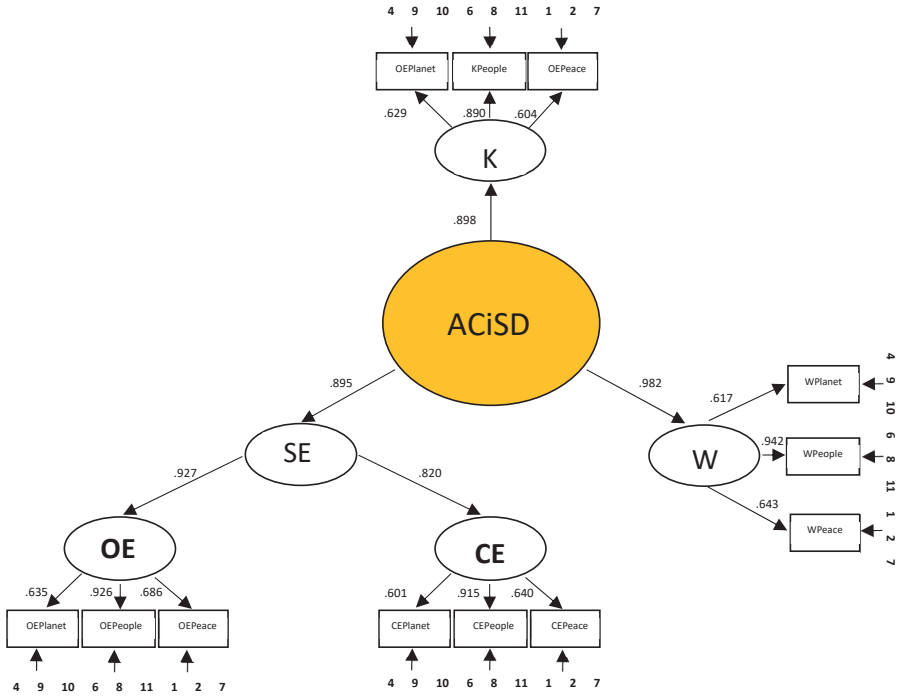


Figure 8. CFA model of the Action Competence in Sustainable Development Questionnaire (ACiSD-Q) with standardised factor loadings. ACiSD = action competence in sustainable development; K = conceptual knowledge of actions for SD; W = willingness; SE = self-efficacy; CE = capacity expectations; OE = outcome expectancy; _mean = mean sum scores; 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 A4). Error covariances between conceptual knowledge, willingness, capacity expectations, and outcome expectancy of planet and peace items are not represented here for reasons of clarity.

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 8 shows the final third-order ACiSD model with standardised factor loadings. It includes measurement of 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

Table 8. Model fit indices for the final third-order ACiSD-Q model and combined ACiSD-Q, Utilization, Preservation, and Sustainability Behaviour model (step 4)

	χ^2	CFI Standard Robust	TLI Standard Robust	RMSEA Standard Robust	SRMR 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 0.075 *p* =0.164 *p* =0.000	0.030 0.030
ACiSD, Utilization, Preservation, and Sustainability Behaviour	3783.470 *df* = 603 *p* = 0.00	0.975 0.929	0.973 0.922	0.061 0.058 *p* =0.00 *p* =0.000	0.058 0.058

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 8, standardised 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. This final model was validated with good to adequate model fit estimates (Brown, 2015) resulting from robust analyses, using diagonally weighted least square estimation (χ^2 = 386.132, df = 37, p <.001, SRMR = 0.030, RMSEA = 0.075 with p<.001, CFI = 0.988, TLI = 0.979). Table 8 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 behaviour, validation through calculation of CFA showed good model fit (χ^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 9) 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 p<.0001 level.

Table 9. 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 p<.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 behaviour subconstruct of the Sustainability Consciousness Questionnaire's short version (SCQ-S; Gericke et al., 2019).

Table 10. Latent factor correlations of ACiSD with Utilization, Preservation (2-MEV), and Sustainability Behaviour (SCQ-S) and heterotrait-monotrait (HTMT) ratio of correlations between brackets

	2-MEV		SCQ-S
	Utilization	Preservation	Sustainability Behaviour
2-MEV Preservation	-.10** (.17)		
SCQ-S Sustainability Behaviour	-.01^{ns} (.15)	.78** (.77)	
ACiSD	- .06* (.14)	.69** (.67)	.80** (.75)

*Note: ns Correlation is non-significant; * Correlation is significant at the p<.05 level; ** Correlation is significant at the p<.001 level*

As expected, analyses showed significant ($p < .001$) strong correlations between the ACiSD and Preservation (.69; HTMT: .67), and also between ACiSD-Q and Sustainability Behaviour (.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 behaviour as measured by the SCQ-S. Moreover, the correlation of latent factor Sustainability behaviour with Utilization was non-significant. Table 10 provides latent factor

and HTMT ratio of correlations for Utilization, Preservation, Sustainability Behaviour, 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 A3 in Appendix 3.

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 sub-concepts of conceptual knowledge, willingness, capacity expectations, and outcome expectancy. The statements each focus on nine items covering sustainable development sub-concepts 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 centre. We refer to Tables A4 and A5 (Appendix 4) for a presentation of the ACiSD-Q in English and Dutch, respectively. 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.

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' behaviour 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 behaviour 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 et al., 2015). In view of the strong correlation between ACiSD and sustainability behaviour 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 behaviour 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 programmes it can guide assessment of which aspects of the educational approach or change programme intervention need finetuning to increase overall AC or AC subconstructs of early adolescent students or participants.

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 had not seen many major direct influences of issues such as climate change at the moment of data collection for the current study. 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 behaviour was measured through self-reports, which can be regarded as indicative but not as a substitute for real behaviour.

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 behaviour (step 4), as well as for examination of how and which ESD principles influence what ACiSD sub-concepts. Finally, administration in other national settings would provide cross-cultural validation of the instrument proposed in this study.

Conclusions

In times when the natural world is at risk, action is called for (Chawla, 2009). Action is a volitional behaviour 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 (2020) call for an operationalisation 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 sub-concepts 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 programmes for early adolescents with a focus on sustainable development. Scholars interested in sustainability behaviour can get useful information on how action competence affects behaviour. 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 programmes through the proposed instrument.

Acknowledgements

The authors would like to thank all participating schools and respondents for their constructive cooperation and feedback. We thoroughly appreciated the feedback and comments on the initial draft of the questionnaire received from the members of the VALIES advisory board and core team, and by Qiyao "Gaby" Gao and Staf Boeve-de Pauw. We are grateful for the help of all working students and colleagues involved in the data collections and digitalisation of paper questionnaires for steps three and four. Finally, feedback received from the journal's editor and anonymous reviewers was greatly appreciated.

Chapter 5

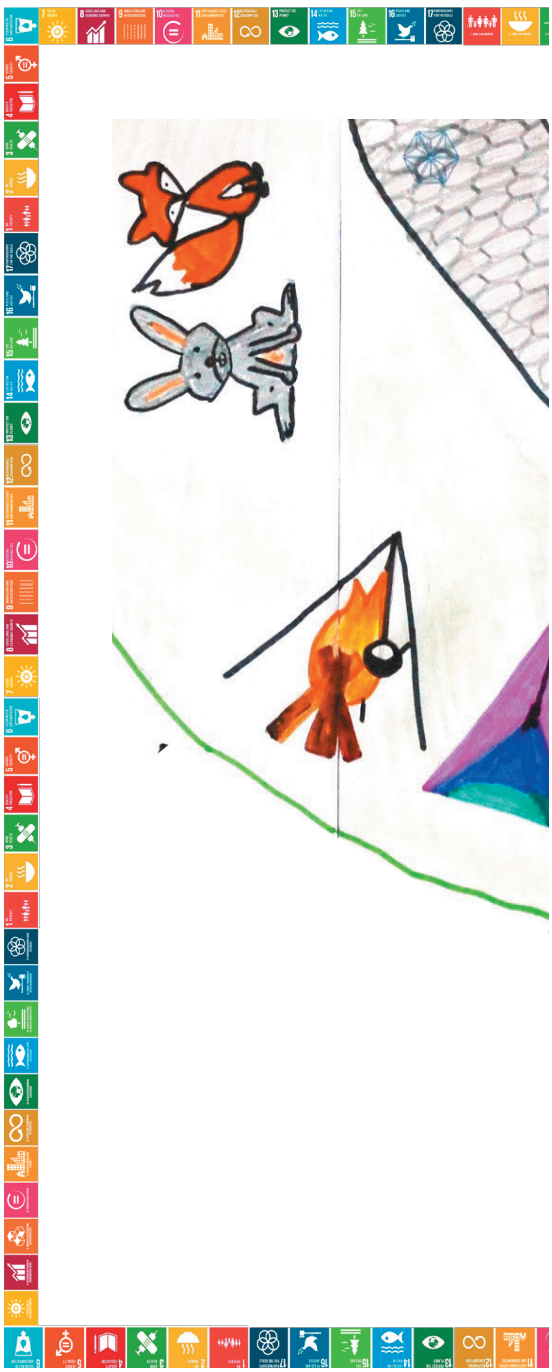
Honing action competence in sustainable development:

What happens in classrooms matters

Chapter 5

Effectiveness research is moving towards embracing learning contents beyond mathematics, science, and language. Therefore, ACiSD (action competence in sustainable development) is introduced as a candidate learning outcome. To initiate adding learning outcome ACiSD to effectiveness research, the current study aimed to establish whether formal education matters to students' ACiSD. Firstly, we studied how much variance in ACiSD can be attributed to what happens in classrooms. Secondly, we looked into how class groups' and students' ACiSD changed after one school year. Multilevel analyses were performed on survey data. We found 11% of variance in ACiSD was attributable to the classroom level (ranging between 7.2% and 14.2% for ACiSD subconstructs). Moreover, individual students' and class groups' ACiSD scores increased when comparing beginning and end of one schoolyear. In sum, our evidence suggests the classroom level matters. Further research can now focus on whether teachers' educational approaches affect these changes.

This chapter is based on Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (2022). Honing Action Competence in Sustainable Development: What happens in classrooms matters. Environment, Development and Sustainability.



Honing action competence in sustainable development:
What happens in classrooms matters

"Today, I want to talk about the climate crisis being a generational injustice. How many more COPs are we going to have before we take action? We know exactly what needs to be done. And it starts by opening our hearts and our spirits. We must protect indigenous peoples' rights to care for their land, i.e. the 80% of biodiversity that is protected under their stewardship."

Xiye Bastida (19, the Otomi-Toltec nation Mexico, at UN COP26, 2021)

Introduction

Research into the effects of current and future climate change scenarios on living conditions (e.g. Javadinejad, Dara, & Jafary, 2020; Kerich, 2020; Oo, Zin, & Kyi, 2020) guides our attention to the need for sustainable development. Along with the research community, also international policy makers keep underscoring the importance of sustainable development in order to secure acceptable living conditions for current and future generations (European Commission, 2019; United Nations, 2019). These policy recommendations build onto the 17 Sustainable Development Goals (United Nations, 2015), which aim at working towards sustainable development, which was defined as a process of mutually interacting environmental, social, and socio-economic perspectives. Educational efforts at all levels are paramount if we are to promote environmental and sustainable behaviour that would allow to take on the challenges involved (Amézaga, Camarena, Figueroa, & Realivazquez, 2021; Minelgaitė & Liobikienė, 2021; Sekhar & Raina, 2021). In order to monitor these efforts, measurement of learning outcomes is crucial (Amézaga et al., 2021; UNESCO, 2017). Still, educational effectiveness research has mainly focused on cognitive learning outcomes of single subjects such as mathematics, (native) language, and sciences. Various voices have suggested broadening this scope by also including affective and social educational goals (Muijs, 2006; Muijs et al., 2014; Reynolds, Chapman, et al., 2016; Townsend, MacBeath, & Bogotch, 2016). In line with Reynolds, Chapman, et al.'s (2016) call to make educational effectiveness research more relevant to practitioners and policymakers, Kelly and Clarke (2016) advocated focusing on sustainable development issues. In order to find adequate solutions to such issues and act upon them, relevant knowledge, awareness, and competence are needed (Amoah & Addoah, 2021; Ari & Yilmaz, 2017; Milfont, 2012; Yilmaz & Can, 2020). Action competence in sustainable development (ACiSD) consists of the relevant knowledge, willingness, capacity expectations, and outcome expectancy regarding actions for sustainable development (Jensen 2000; Mogensen & Schnack 2010; Sass et al., 2020). As such it is a desired learning outcome of education for sustainable development, which aims to prepare students for current and future sustainability challenges (Breiting & Mogensen, 1999). Consequently, ACiSD can be considered a suitable outcome variable for measuring effectiveness of educational efforts that focus on sustainable development. Theoretic claims have been made about action-oriented ESD as a promising approach to teaching, i.e. at class group level, that would foster ACiSD (Mogensen & Schnack, 2010; Sinakou, Donche, Boeve-de Pauw, & Van Petegem, 2019). The rationale was that through this democratic and action-oriented approach to teaching students would learn about and for sustainable development, and as agents of change (Sinakou et al., 2019; Varela-Losada et al., 2016). In other words, by allowing students to participate in decision-making processes through deliberative discussions about real-world controversial issues, they would build sustainability competences such as ACiSD (Ottander & Simon, 2021). However, studies providing evidence that confirms these theoretic assumptions are lacking. Effectiveness research has found differences between schools as well as between class groups in learning

outcomes such as mathematics, language, and science (Reynolds et al., 2014; Scheerens, 2016). Moreover, the importance of the classroom level for explaining variance in learning outcomes is now widely accepted, since it was found to explain more variance than the school level (Chapman et al., 2016; Hattie, 2009; Scheerens, 2016). This level does not only consist of "manipulations" by the teacher, but is also affected by "an ecology" (Scheerens, 2016, p. 4) that includes factors such as whether there is an open and safe atmosphere where mistakes are considered opportunities for learning, the kind of interactions between students, and between teacher and students (Hattie, 2009; Scheerens, 2016). Consequently, before teacher effectiveness regarding implementation of an educational approach thought to promote ACiSD can be studied, there is a need to establish whether changes in learning outcomes such as ACiSD can be attributed to this overall classroom level. It is the aim of this study to fill this research gap. We will look into the extent to which the classroom level matters to changes in overall ACiSD within early adolescents as well as to their conceptual knowledge, willingness, capacity expectations, and outcome expectancy regarding actions for sustainable development. In this, we are especially interested in early adolescents, i.e. ten to fourteen-year-olds, because that is when civic involvement is developed (Smetana et al., 2006). As sustainability knowledge and awareness enhances future policy makers' and managers' engagement for developing a sustainable future (Sekhar & Raina, 2021), this adds to the importance of the stage in life when civic involvement is developed. The following research questions (RQ) guided our research:

1. To what extent does early adolescents' ACiSD differ with the class group they belong to?
2. To what extent do changes in early adolescent students' ACiSD during a school year depend on the class group they belong to?

Answers to these two research questions will contribute to the literature by paving the way for ACiSD to be included as a learning outcome in educational effectiveness research. Educational practitioners will be informed about the effects on students' ACiSD development of what happens in class groups. Finally, policymakers may find evidence to justify the attention paid to ACiSD development in formal education.

Literature review

In what follows, we will explore existing literature concerning 1) differences in explained variance regarding learning contents such as mathematics, science, and (native) language, and 2) the concept of ACiSD as a learning outcome of education for sustainable development.

Differences in explained variance regarding learning contents mathematics, science, and (native) language

In the field of educational effectiveness research, reviews of the literature have confirmed that factors at the classroom level explain variance in learning outcomes to a much larger extent than between-school factors. This led to consensus about the importance of class groups (Hattie, 2009). Moreover, especially in early adolescence, students may turn towards their peers for support and social modelling (Hattie, 2009; Smetana et al., 2006), which adds to the importance of class groups. Depending on the review consulted, educational effectiveness research reports on different effect sizes of by classroom and teacher level explained variance in overall learning outcomes, varying from an average of 10-20 percent (Muijs, 2006) over about 15 to 18 percent (Scheerens, 2016) to 25 percent of total variance (Reynolds, Teddlie, et al., 2016). In this, differences between learning content areas have to be acknowledged (Chapman, Reynolds, et al., 2016). Overall, variation in both school and teacher effectiveness seems to be higher in mathematics and science as compared to language and non-cognitive learning outcomes (Chapman et al., 2016; Hattie, 2009; Sammons, Davis, & Gray, 2016; Reynolds et al., 2014). A possible explanation may lie in that parents are more likely to influence their children's language acquisition and spend less time on doing mathematics or science with them at home (Hattie, 2009; Scheerens, 2016; Reynolds et al., 2014; Sammons et al., 2016). Furthermore, non-cognitive learning outcomes may be less prominently focused on in school curricula, whereas students may be more engaged in non-academic learning when spending time outside the school (Reynolds et al., 2014).

In sum, educational effectiveness research reveals that 10 to 25 percent of variance in average overall learning can be attributed to school and classroom levels. School and classroom effects tend to be higher for outcomes that are typically less focused on outside school, such as mathematics and sciences. Effects on language and non-cognitive outcomes are typically lower, as students are possibly more exposed to those in the homes and other contexts outside school.

Action competence in sustainable development (ACiSD)

As outlined earlier, a desired outcome of education for sustainable development is action competence, which involves acquisition and creation of the relevant conceptual knowledge of action possibilities, willingness to contribute, and self-efficacy. The latter comprises confidence in one's capacity for change (capacity expectations) and in the effect (outcome expectancy) of the action (Breiting et al., 2009; Jensen, 2000; Jensen & Schnack, 2006; Sass et al., 2020). When considering action competence in sustainable development (ACiSD) the action aims to contribute to solving sustainability issues. The United Nations defined sustainable development as consisting of interrelated aspects that include environmental and climatic (planet), social (people), economic (prosperity), and peace concerns, which all individuals, local communities, and participating nations engage to take on in partnership. This engagement aims to build a better life for current and future generations, which explicitly involves respecting the planet's finite resources and addressing concerns about dwindling diversity both in the natural and cultural world (United Nations, 2015).

Consequently, as shown in Figure 9, ACiSD encompasses students' conceptual knowledge of sustainable development action possibilities, willingness to contribute to sustainable development, confidence in one's capacities for change towards a more sustainable future, and confidence that the action taken will contribute to sustainable development (Sass et al., 2020).

In the following sections we will first describe the current study's methodological aspects of ethical considerations and bias, the instruments used to measure the participating students' ACiSD at beginning and end of one schoolyear, the samples used for answering

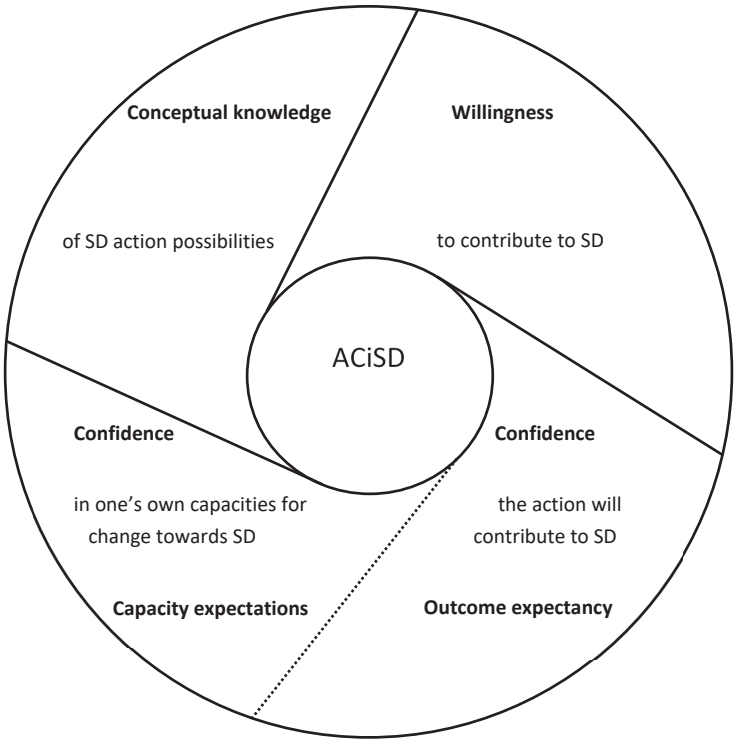


Figure 9. Core features of ACiSD (after Sass et al., 2020)

the two research questions, and the rigorous analytical procedure we applied. In the results section, we provide a detailed presentation of the evidence we found. Finally, we summarise our findings and integrate them in the current literature in the conclusion and discussion section.

Methods

Ethical considerations and bias

Participants' answers were only used in analyses after thoroughly informed active consent was given by both the participants and one of the parents. The 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, and informed that their participation was voluntary. Participants were asked not to communicate with each other while completing the questionnaires to prevent peer pressure (Scott, 2008).

Measures

We measured students' action competence in sustainable development using the 36-item Action competence in sustainable development questionnaire (ACiSD-Q; Sass, Boeve-de Pauw, De Maeyer, & Van Petegem, 2021), which was developed for our target population of 10 to 14-year-olds (see Figure 10). The ACiSD-Q is a validated instrument that consists of four statements regarding nine items (also see Chapter 4). The four statements tap into action competence sub-concepts conceptual knowledge, willingness to perform, and two self-efficacy measures, i.e. capacity expectations and outcome expectancy regarding actions for sustainable development. The nine items cover actions for sustainable development with three items for environmental (planet: items 4, 9, and 10), social (people: items 6, 8, and 11), and peace (items 1, 2, and 7) actions respectively. For the full statements and questions, we refer to Tables A4 and A5 (Appendix 4; English and Dutch versions, respectively) which uses the same item numbers and subconstruct codes (K, W, SE, CE, and OE) as Figure 10.

Respondents express (dis)agreement with the statements through a 5-point Likert scale that includes a neutral centre (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). This measurement instrument was developed in cooperation with the target population, i.e. early adolescents (aged 10 to 14). The nine items that cover the sustainable development categories of environmental, social, and peace issues, were drawn from early

adolescents' own suggestions for feasible actions in a pre-study (for a more detailed description we refer to Sass, Quintelier, et al., 2021 and Sass, Boeve-de Pauw, et al., 2021).

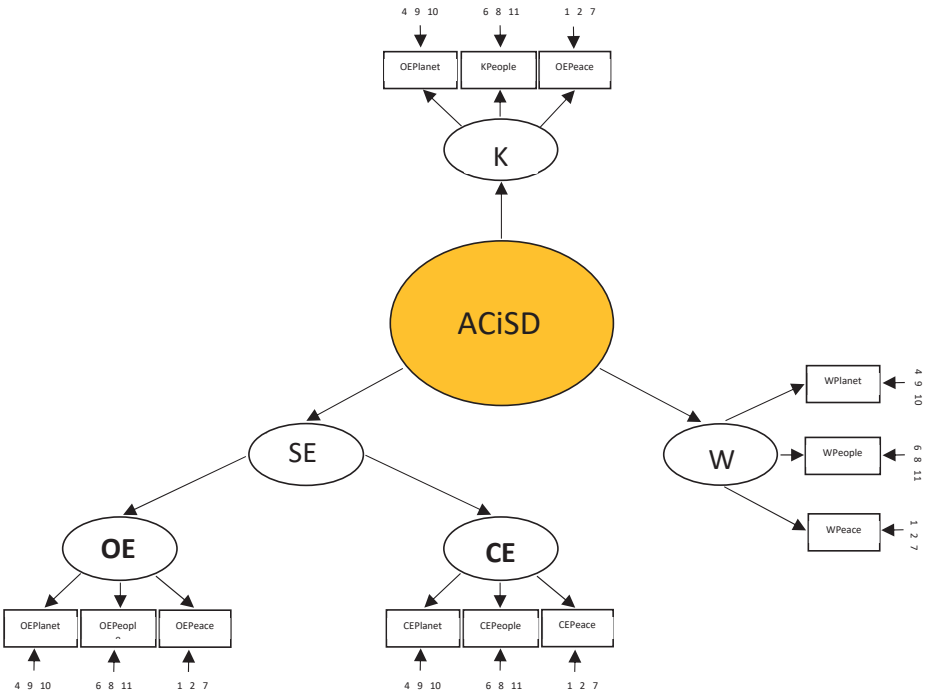


Figure 10. The ACiSD-Q model consists of latent variables self-efficacy (SE), conceptual knowledge (K), and willingness (W). Self-efficacy consists of two subconstructs: capacity expectations (CE) and outcome expectancy (OE). The first-order variables consist of items categorised into environmental (Planet: items 4, 9, 10), social (People: items 6, 8, 11), and peace aspects (Peace: items 1, 2, 7) of sustainable development. (After Sass et al., 2021)

Samples

This research is part of a larger project, Valorising Integrated and Action-Oriented Education for Sustainable Development at School (VALIES). The aim of this project is to study the critical success factors and barriers for bringing integrated and action-oriented education for sustainable development into schools in Flanders, Belgium. For the current research, data were collected through convenience sampling at beginning and end of school year 2019-2020.

The ACiSD questionnaire was administered to 1398 participants in grades five, six, and eight by teachers in the classroom during one class period at the start of the school year (M0) for answering RQ1. Seventh graders were excluded, because this is the first year in secondary

education, when students typically change schools. Consequently, grade seven students had only been part of their class group for one month. From these 1398 participants, complemented with seventh graders, 633 filled the questionnaire both at the beginning (M0) and end of the school year (M1) for answering RQ2 as shown in Figure 11. The participating schools could opt either for administration on paper (79.5% of participants at M0) or online (91% of participants at M1). Due to circumstances related to the COVID-19 pandemic, most students filled the questionnaires online at home at the end of the school year. They received the instructions given orally in class at M0 and in writing for M1.

Figure 11. Overview of samples used for answering research question one (M0; grades 5, 6, and 8: n = 1398) and research question two (M0 and M1; grades 5 to 8 including grade 7: n = 663)

All teachers (and for the second measurement of RQ2 also the responsible adults at home) received the same instructions to enhance reliability. They could give technical assistance, but were asked not to help respondents with interpreting items or questions. 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.

As data for the first research question were collected at the start of school year 2019-2020 and many students change schools between primary and secondary, students in grade seven (the first year of secondary) were excluded from the sample used for RQ1 (*To what extent does early adolescents' ACiSD differ with the class group they belong to?*). This resulted in a sample of 1398 participants in grades five, six, and eight (mean age 11.12) across 98 class groups in 40 schools that covered all five provinces of Flanders. In this sample that consisted of 1060 primary and 338 secondary school students, 751 participants were male, 620 female, and 27 preferred not to disclose their gender, as can be seen in Table 11 which provides an overview of the samples used for both research questions.

Table 11. Description of samples for research questions one and two

		RQ1	RQ2
Schools: *n*		40	29
Class groups		98	57
Grades		5, 6, 8	5, 6, 7, 8
Participants: *n*		1398	633
Mean age		11.12	11.83
Gender:	male	751 (54%)	327 (52%)
	female	620 (44%)	305 (48%)
	undisclosed	27 (2%)	1 (<0.2%)
Level:	Primary	1060	244
	Secondary	338	389

For the second research question (*To what extent do changes in early adolescent students' ACiSD during a school year depend on the class group they belong to?*), participants in grade 7 were also included, as this involved analyses of two different measurements, at the beginning (M0) and end (M1) of school year 2019-2020. Consequently, all students had been part of their class group for at least one complete school year at the time of the second measurement. This sample of 633 participants (mean age 11.83), of which 327 were male, 305 female, and one did not disclose their gender, included 244 primary and 389 secondary school students across 57 class groups in 29 different schools across the five Flemish provinces. Table 11 gives an overview of all samples used for answering both research questions.

Analytic procedure

In what follows we first describe the multilevel analyses that addressed students' responses to the ACiSD-Q at the start of the school year in order to establish to what extent the classroom level affects students' ACiSD (RQ1). We then describe multilevel analyses performed to capture possible changes in their responses across two different moments, i.e. at the beginning and end of one school year (RQ2). Multilevel models were implemented for both research questions to account for the fact that observations are not independent (Hox, Moerbeek, & van de Schoot, 2017). As there is evidence in the literature that gender and educational level may affect students' concerns regarding sustainable development (Ari & Yilmaz, 2017; Lee, Grace, Rietdijk, & Lui, 2019; Olsson, Gericke, Boeve-de Pauw, Berglund, & Chang, 2019) and participants to our study included boys and girls in

primary and secondary school, we also controlled for gender and educational level (i.e. primary or secondary) to find out how much variance in ACiSD and its subconstructs (conceptual knowledge, willingness, capacity expectations, and outcome expectancy) remained attributable to the classroom level. Additionally, we provide descriptive statistics (means and standard deviations) for ACiSD and its subconstructs in Table A6 (see Appendix 5).

All analyses were performed using RStudio 4.0.2. For answering the first research question, we used R Packages lme4 (Bates, Mächler, Bolker, & Walker, 2015) for fitting and analysing multilevel models, and lmerTest (Kuznetsova, Brockhoff, & Christensen, 2017) for calculating p-values. For answering the second research question, we used R-package 'nlme' (Pinheiro et al., 2014) for estimations, and ggplot2 (Wickham, 2016) for visualisation of results.

We provide fixed effects and variance estimates for both research questions.

Analytic procedure for answering RQ1

As we collected data of individual students that were part of class groups, our data were treated as nested with students at level 1 (n = 1398) and the class groups to which they pertained at level 2 (n = 98). We estimated several models: 1) overall ACiSD; 2) conceptual knowledge of action possibilities; 3) willingness to perform actions for sustainable development; 4) overall self-efficacy, and self-efficacy subconstructs 5) capacity expectations and 6) outcome expectancy regarding the actions for sustainable development. Variance estimates were used for calculating intraclass correlation coefficients (ICC) to provide the proportion of variance in ACiSD attributable to the classroom level. We compared model fit of the different models and controlled for gender and educational level (primary or secondary education).

Analytic procedure for answering RQ2

Our data can be viewed as multilevel multivariate data where responses at different time points (M0, M1) are treated as different variables (Rabe-Hesketh & Skrondal, 2012) that are modelled simultaneously. The two responses (at the beginning and end of the school year; level 1) are nested within individual students (level 2; n = 633), who are part of individual class groups (level 3; n = 57). For answering the second research question, we modelled two intercepts (being a mean score at each moment, i.e. M0 and M1), two variances between students and two variances between class groups (one per moment so the model considers that the variance between students and class groups can be a function of the moment in the procedure). We performed likelihood ratio tests to compare models in which we allowed for differences in variance of change (from MM0 to MM1) between individuals with models in which also differences in change between class groups were included. Again, all analyses were conducted separately for the overall ACiSD as well as for

subconstructs conceptual knowledge, willingness, overall self-efficacy, and self-efficacy subconstructs capacity expectations, and outcome expectancy.

Results

In this section, we first discuss the results of the multilevel analyses that address 1398 students' responses to the ACiSD-Q at the start of the school year (RQ1). We then describe changes in their responses across two different moments (*n* = 633), i.e. at the beginning (M0) and end (M1) of one school year (RQ2).

Research question 1: To what extent does early adolescents' ACiSD differ with the class group they belong to?

After controlling for gender and educational level, 11% of variance in ACiSD (ICC = 0.111) was attributable to the classroom (*sd* between class groups = 0.178, *sd* within class groups = 0.506). In line with Lee et al. (2019) and Olsson et al. (2019), girls significantly scored slightly higher than boys as did primary school students in comparison to secondary regarding overall ACiSD as well as all subconstructs.

As shown in Table 12, our evidence suggested that at subconstruct level classrooms affected conceptual knowledge of actions for sustainable development most (13.8%, *sd* between groups = 0.205, *sd* within groups = 0.513), followed by self-efficacy (10.6%, *sd* between groups = 0.194, *sd* within groups = 0.563). The smallest effect of classrooms was found with willingness (9.4%, *sd* between groups = 0.191, *sd* within groups = 0.592). Notably, both the smallest and largest portions of by class group explained variance were found within the self-efficacy subconstructs capacity expectations (7.2%, *sd* between groups = 0.170, *sd* within groups = 0.614) and outcome expectancy (14.2%, *sd* between groups = 0.252, *sd* within groups = 0.620).

In sum, our evidence showed that the classroom level affected both overall ACiSD (11% of variance attributable to classrooms) and its subconstructs conceptual knowledge of actions for sustainable development, willingness to contribute to such actions, capacity expectations, and outcome expectancy, with between 7.2% and 14.2% of variance explained by the classroom level. Self-efficacy subconstructs capacity expectations and outcome expectancy were affected by the classroom level least (7.2%) and most (14.2%), respectively.

Table 12. Estimates of fixed effects and variance estimates for base model and after controlling for gender and educational level (primary, secondary) with by class group explained variance in ACiSD and its subconstructs (ICC)

	Fixed effects		**Variance estimates**				
	Intercept	SE	Between class groups	SD	Residual	SD	ICC
ACiSD Parameter estimate	3.912***	0.031	0.032	0.178	0.256	0.506	0.111
Conceptual Knowledge Parameter estimate	4.024***	0.033	0.042	0.205	0.263	0.513	0.138
Willingness Parameter estimate	3.885***	0.034	0.036	0.191	0.351	0.592	0.094
Self-efficacy Parameter estimate	3.821***	0.034	0.038	0.194	0.317	0.563	0.106
Capacity Expectations Parameter estimate	3.771***	0.034	0.029	0.170	0.377	0.614	0.072
Outcome expectancy Parameter estimate	3.862***	0.041	0.063	0.252	0.384	0.620	0.142

5-point Likert answer scales (1 = I totally disagree; 3 = I do not agree and do not disagree; 5 = I totally agree)

Note: *** = significant at level p<.001; SE = standard error; SD = standard deviation; ICC = intraclass correlation coefficient

Table 13. Overview of Likelihood ratio tests (models 1 only allow for differences in variance of change between individuals; models 2 allow for both differences in variance of change between individuals and between class groups)

Construct	Model	*df*	AIC	BIC	loglikelihood	test	Likelihood ratio	*p*
ACiSD	1	10	1444.935	1495.911	-712.4677	1 vs 2	17.19757	0.0002
	2	12	1431.738	1492.908	-703.8689			
Conceptual knowledge	1	10	1692.157	1743.458	-836.0785	1 vs 2	10.23517	0.006
	2	12	1685.922	1747.483	-830.9609			
Willingness	1	10	1980.349	2031.634	-980.1745	1 vs 2	20.83986	<.0001
	2	12	1963.509	2025.051	-969.7546			
Self-efficacy	1	10	1740.178	1791.235	-860.0888	1 vs 2	11.96733	0.0025
	2	12	1732.210	1793.480	-854.1051			
Capacity expectations	1	10	1988.039	2039.236	-984.0196	1 vs 2	15.11576	0.0005
	2	12	1976.924	2038.359	-976.4618			
Outcome expectancy	1	10	2147.137	2198.334	-1063.569	1 vs 2	16.93622	0.0002
	2	12	2134.201	2195.637	-1055.101			

Research question 2: To what extent do changes in early adolescent students' ACiSD during a school year depend on the class group they belong to?

We compared two models (likelihood ratio tests). In the first model we allowed change (from MM0 to MM1) to differ between individuals. The second model additionally allowed differences in change between class groups. The latter more complex model significantly fitted our data best for ACiSD as well as for all its subconstructs (see Table 13 for an overview).

As can be seen in Table 14, results indicated a statistically significant positive relationship between time and ACiSD (+ 0.086) after controlling for gender and educational level. This means that scores increased over time (p <.001). Class groups that started with a lower mean ACiSD score showed a larger increase than those that had scored higher at M0 (correlation of *sd* M0 and M1 = -0.677). This was also the case for individual students (correlation of *sd* M0 and M1 = -0.440). In sum, both individual students and class groups showed higher ACiSD scores at the end of the schoolyear. Moreover, those who scored lower at the beginning of the schoolyear gained more than those who already scored higher initially.

Table 14. Parameter estimates (Est.) and standard errors (SE) for the mean score at the start of the school year (M0) and the difference between the mean score at the end and the beginning of the school year (Δ M1 – M0); estimates of the parameters in the random part are standard deviations (SD) and correlations (corr) (based on Model 2, controlling for gender and educational level)

	Fixed part		Random part					
			Between Class Groups			Between Individuals		
	M0	Δ M1-M0	M0	Δ M1-M0	M0 & Δ M1-M0	M0	Δ M1-M0	M0 & Δ M1-M0
	Est. (SE)	Est. (SE)	SD	SD	corr	SD	SD	corr
ACiSD	3.852 (0.050) ***	0.086 (0.028) ***	0.190	0.150	-0.677	0.408	0.364	-0.440
Conceptual Knowledge	3.996 (0.051) ***	0.067 (0.028) *	0.200	0.135	-0.756	0.416	0.443	-0.476
Willingness	3.817 (0.058) ***	0.040 (0.04)	0.213	0.190	-0.603	0.522	0.526	-0.466
Overall Self-efficacy	3.792 (0.055) ***	0.128 (0.031) ***	0.204	0.159	-0.612	0.339	0.106	-0.240
Capacity Expectations (self-efficacy)	3.726 (0.051) ***	0.102 (0.035) **	0.175	0.189	-0.689	0.386	0.103	-0.542
Outcome expectancy (self-efficacy)	3.836 (0.067)***	0.173 (0.039) **	0.275	0.211	-0.695	0.409	0.389	-0.381

5-point Likert answer scales (1 = I totally disagree; 3 = I do not agree and do not disagree; 5 = I totally agree
*Note: * = p <.05; ** = p<.01; *** = p<.001*

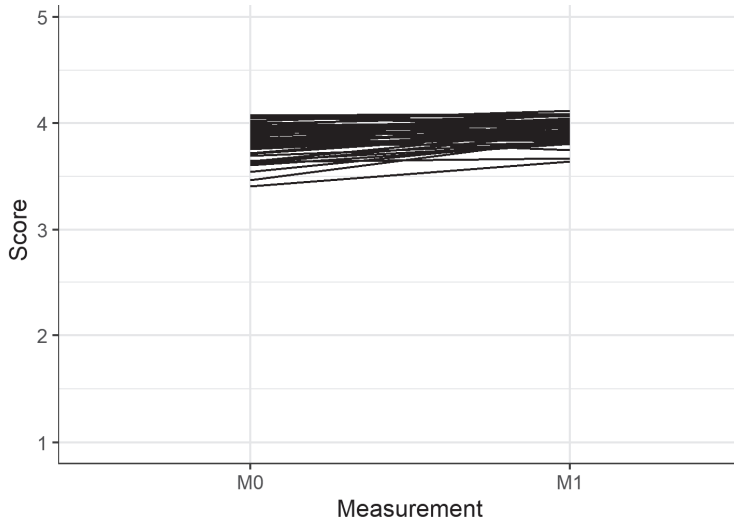


Figure 12a. Graphical representations of mean estimated ACiSD scores per class group

We found similar results for subconstructs conceptual knowledge, willingness (albeit significant at the $p<.05$ level and non-significant, respectively), and overall self-efficacy ($p<.001$). Mean scores significantly increased with 0.067 for conceptual knowledge and 0.128 for overall self-efficacy. Correlations between standard deviations at M0 and M1 for class groups were -0.756 for conceptual knowledge and -0.612 for overall self-efficacy,

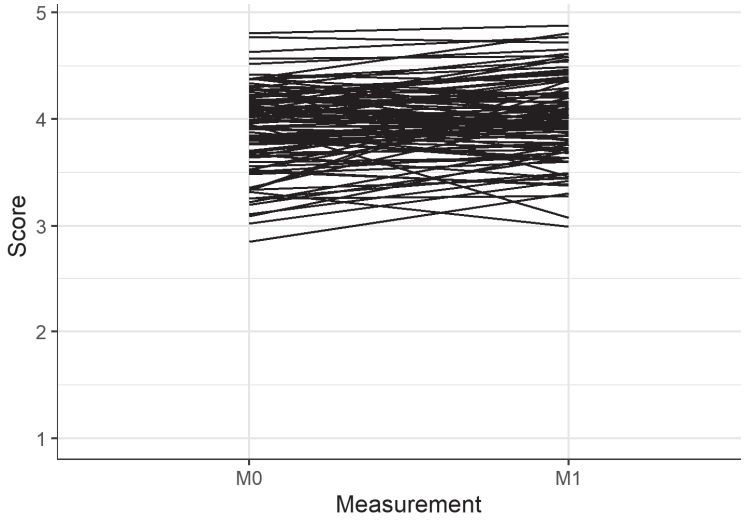


Figure 12b. Graphical representations of mean estimated ACiSD scores per student (random sample of 100 students)

while those between individual students showed values of -0.476 for conceptual knowledge and -0.240 for overall self-efficacy.

Finally, both self-efficacy subconstructs, i.e. capacity expectations (+0.102) and outcome expectancy (+0.173) showed a statistically significant increase at M1 (p<.01) compared to M0. Again, we found negative correlations between standard deviations at M0 and M1 for class groups (-0.689 for capacity expectations, -0.695 for outcome expectancy) as well as between individual students (-0.542 for capacity expectations, -0.381 for outcome expectancy).

Compared to the beginning of the school year (M0), results indicate increases in overall ACiSD and all its subconstructs by the end of the school year (M1), which are statistically significant except for subconstruct willingness. At class group as well as at individual student level, correlations between scores at M0 and changes between M1 and M0 were negative as can be seen in Figures 12a and 12b, respectively, for overall ACiSD. This means that scores of class groups and individual students that showed lower values at M0 increased more than those who scored higher at the beginning of the schoolyear.

Conclusion and discussion

Both the research community (e.g. Javadinejad et al., 2020; Kerich, 2020; Oo et al., 2020) and policy makers (e.g. European Commission, 2019; United Nations, 2019) underscore the importance of sustainable development in overcoming the challenges set by issues such as climate change. Education is thought to be key in preparing future generations for facing these issues (Amézaga et al., 2021; Minelgaitė & Liobikienė, 2021; Sekhar & Raina, 2021). However, before educational efforts can be monitored, research should ask whether formal education in schools and classrooms affects students' action competence in sustainable development (ACiSD). The current study contributed by revealing that the classroom level matters to changes in ACiSD within 10 to 14-year-old students. Analyses of our data showed that 11% of variance in ACiSD could be attributed to the classroom level. After controlling for gender and educational level, our evidence further suggests that classrooms affect especially conceptual knowledge of actions for sustainable development and self-efficacy subconstruct outcome expectancy as it explained 13.8 % and 14.2 % of variance respectively. Interestingly, self-efficacy subconstructs capacity expectations (7.2 %) and outcome expectancy (14.2%) showed smallest and highest proportions of variance attributable to the classroom level. As trust in one's own capability to solve sustainable development issues enhances behavioural change (Bandura, 1977; Chawla, 2009; Wu & Mweemba, 2010), teaching programmes would do well to enhance students' capacity expectations. Making students aware of sustainable development issues (Wu & Mweemba, 2010) and giving them opportunities for experiencing their own capacity to make a difference could support them in feeling more confident in their power as change agents (Bandura, 1977). Actions directed towards contributing to sustainable development are

complex, as they have to take into account different, often even conflicting, interests. Therefore partnerships are necessary for tackling SD issues (United Nations, 2015). Consequently, students need to learn how to cooperate (UNESCO, 2017) in order to take collective action (Clark, 2016). Moreover, individual actions may be felt to be inadequate in view of SD issues' global scale. Class groups provide ample opportunities for experiencing collective action among peers. Moreover, collective action enhances participants' self-efficacy regarding the group's and their individual competence for making change (Chawla & Flanders Cushing, 2007). We hypothesise that experiences of collective action may encourage the individual student involved, which may explain the large proportion of explained variance in outcome expectancy, as this refers to students' confidence in a positive outcome of their action. Further research may want to verify these assumptions. Close to 10% of variance in motivational aspects such as willingness (9.4%) and overall self-efficacy (10.6%) was attributable to the classroom level. These proportions of explained variance in overall ACiSD and its subconstructs are in line with explained variance in learning outcomes in cognitive domains ranging between 10 and 20 % (Muijs, 2006). Attitudes towards the environment in the family homes have also been found to influence behaviours regarding sustainable development (Corral-Verdugo, Lucas, Tapia-Fonllem, & Ortiz-Valdez, 2019). Consequently, given that classrooms typically explain more variance in domains such as mathematics as compared to language teaching, the proportion of explained variance in ACiSD and its subconstructs found in the current study appears to be in line with previous literature regarding mathematics, science, and language outcomes. When looking into how class groups' ACiSD and subconstructs evolved, we can conclude that all class groups' ACiSD, conceptual knowledge, willingness, capacity expectations, and outcome expectancy increased on average after one school year. However, not all groups and students evolved to the same extent. Groups and individual students with lower levels at the start of the school year, showed a more substantial average increase than did those that started the school year at a higher level. This means that those class groups and students who showed less action competence at the beginning of the school year, benefitted most from a year of class group experience. This may encourage schools to take on the challenge of empowering students for taking action for sustainable development, while seeking connection with attitudes regarding sustainable development the students bring to the classroom from their homes. However, ceiling effects may partly explain this finding, as class groups and students who already scored high to start with had less room for positive change towards the end of the school year.

Further effectiveness research should look into effects of more specific aspects of the 'black box' called classroom on students' development of ACiSD. An educational approach thought to foster ACiSD is education for sustainable development (ESD). Alongside *pluralism*, which encourages different perspectives in discussions regarding possible actions for sustainable development, and an orientation towards *action*, a third feature of ESD is *holism* (Stables & Scott, 2002). This expresses the aim to equip students with the capacity for acknowledging that sustainable development issues consist of interrelated environmental, social, economic, and political aspects that occur in the past, present, and

future, as well as in local, regional, and global contexts (United Nations, 2015). Consequently, ESD should combine three features, i.e. holism (Stables & Scott, 2002), pluralism (Öhman, 2008), and an orientation towards action (Biesta, 2009a; Biesta, 2009b; Chawla, 2009; Mogensen & Schnack, 2010; Sinakou et al., 2019). As this was not the aim of the current study, our data do not allow to attribute the increases in overall ACiSD and its subconstructs to a specific educational approach, such as ESD. Classrooms are an environment in which not only teachers and students, but also students amongst themselves, may influence each other (Scheerens, 2016). Nevertheless, ESD features such as holism, pluralism, and action-orientedness are theoretically expected to enhance students' action competence (Breiting et al.,2009; Ke, Sadler, Zangori, & Friedrichsen, 2020; Öhman, 2008; Sinakou et al., 2019; Stables & Scott, 2002). With our study we paved the way for further teacher effectiveness research that may want to find evidence for and look into the details of this theoretical connection.

Regardless of the contribution the current research made to the field, it was also constrained by limitations that open venues for further research. Firstly, all participants attended schools that took part in the VALIES project (Valorising Integrated and Action-Oriented Education for Sustainable Development at School), which aimed to enhance ESD implementation. Consequently, variance in ACiSD and its subconstructs may have been underestimated in the current study. Future research may want to look into differences between schools or class groups in which ESD was not explicitly implemented. Secondly, our data did not allow reaching any conclusions regarding causal relationships between the implementation of ESD or its features of holism, pluralism, and action-orientedness with students' increased ACiSD or its sub-concepts. It would be interesting to find out if, and what ESD features affect which ACiSD aspects and how this happens. Mixed-method and qualitative studies might shed light on these questions. Qualitative methods, such as class observation, semi-structured interviews and focus groups, would allow to dig deeper into why and how certain teaching approaches help students develop ACiSD, while quantitative methods would shed light on the extent to which these findings go beyond individual contexts and experiences.

Thirdly, as the current study only measured students' ACiSD at two moments, i.e. at the beginning and end of school year 2019-2020, our results may show a more linear development of ACiSD than is realistic. Longitudinal research with more measurements across a longer period of time would allow for a more nuanced insight. Finally, as our evidence suggests that, contrary to the average student and class group, individual students as well as individual classes sometimes showed a negative evolution (see Figures 12a and 12b), these would be interesting cases to compare to students and class groups that showed increases in ACiSD and its subconstructs in subsequent qualitative research.

In conclusion, we are confident that this study has contributed to the field by revealing that what happens in classrooms contributes to changes in early adolescents' ACiSD and its

subconstructs. Regardless of the challenges this poses to schools and teachers, our evidence has paved the way for broadening the scope of teacher effectiveness research beyond isolated basic mathematics, science, and language skills as was called for in the fields of policy (UNESCO, 2017) and academia (Muijs et al., 2014; Muijs et al., 2016). The path has now been paved for researching whether and how teachers' efforts to implement ESD may be fruitful for supporting students in developing action competence, conceptual knowledge of action possibilities, willingness to contribute, capacity expectations, and outcome expectancy regarding sustainable development issues. Thus, the current study constitutes a first step towards monitoring educational efforts that aim to prepare young adolescents for facing future sustainability challenges.

Acknowledgements

The authors would like to thank all participating schools and respondents for their constructive cooperation and feedback. We are also grateful for the help of all working students and colleagues involved in the data collections and digitalisation of the paper questionnaires.

Chapter 6

Effectiveness of ESD practices regarding students' ACiSD:

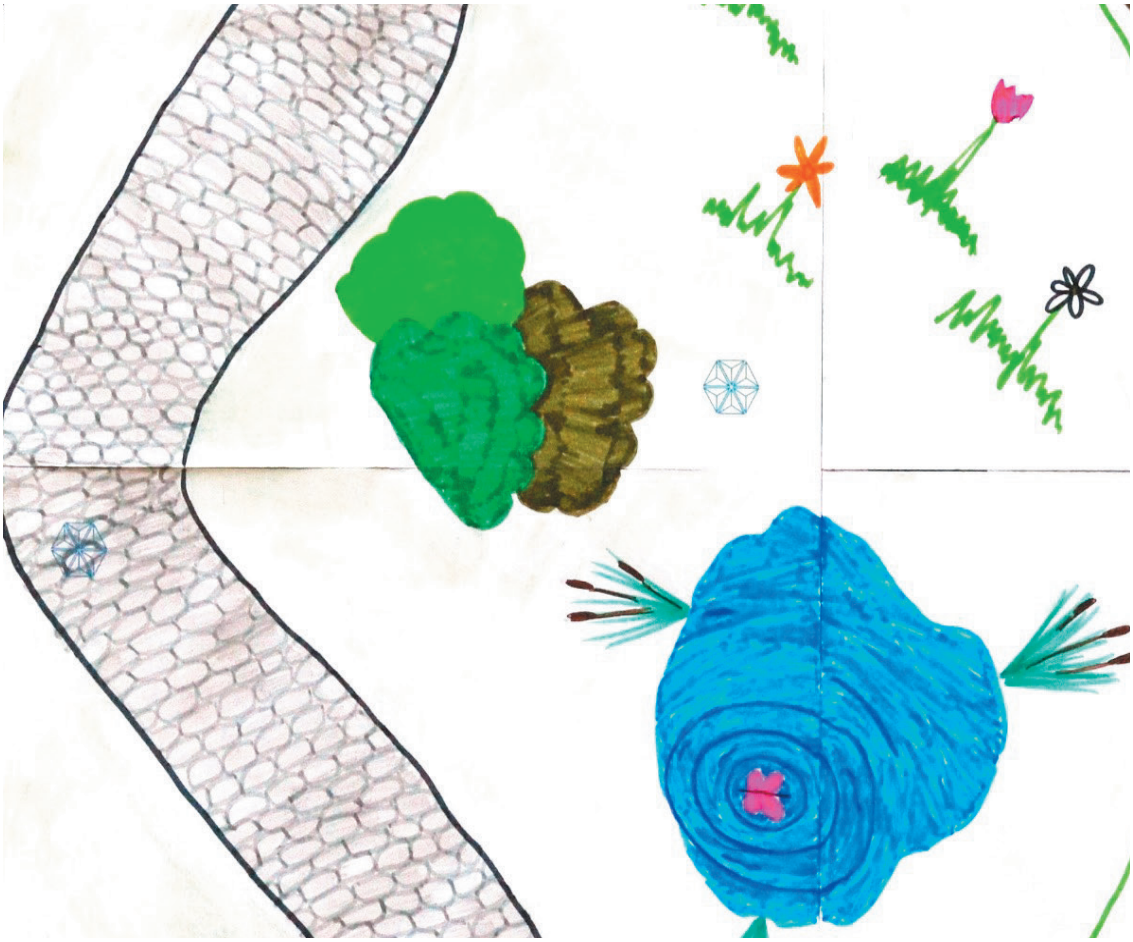
The importance of an action-oriented approach

Chapter 6

ESD is believed to foster students' action competence in sustainable development (ACiSD), i.e. their knowledge, willingness, and self-efficacy regarding action for sustainable development. However, effectiveness research relating to ACiSD as a learning outcome of action-oriented ESD is scarce. We administered two questionnaires to tap into students' 1) self-reported ACiSD and 2) perceptions of the teachers' ESD implementation. Descriptive statistics and multilevel analyses were performed to find out whether students' ACiSD is affected by their perceptions of overall ESD and its features of holism, pluralism, and action-orientedness. Teachers' ESD practices were not clearly perceived. However, an orientation towards action appeared to affect students' ACiSD. While confirming the challenge an ESD implementation poses for teachers, our results may encourage them in their efforts, knowing that action-oriented ESD may facilitate students' ACiSD development.

This chapter is based on Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (submitted). Effectiveness of Education for Sustainable Development Practices Regarding Students' Action Competence in Sustainable Development: The importance of an action-oriented approach. Research in Science & Technological Education.

Effectiveness of ESD Practices Regarding Students' ACiSD: The importance of an action-oriented approach



"We do need hope, of course we do.
But the one thing we need more than hope is action.
Once we start to act, hope is everywhere."

Greta Thunberg (16, TED talks Sweden, 2018)

Introduction

Both policy makers (European Commission, 2019; United Nations, 2019) and scholars in the fields of educational effectiveness and (science) education research (Kelly & Clarke, 2016) highlight the importance of education for tackling current and future sustainability issues. Educational approaches such as education for sustainable development (ESD) aim to support the development of students' agency in general and action competence in sustainable development (ACiSD) in particular (Ke et al., 2020; Mogensen & Schnack, 2010; Sass et al., 2020; UNESCO, 2017). However, although previous research has found evidence that underscores the importance of the classroom level for young adolescents' ACiSD development (Sass, De Maeyer, Boeve-de Pauw, & Van Petegem, 2022), measuring ACiSD as a learning outcome of ESD has proven to be complex and challenging (Mogensen & Schnack, 2010). Consequently, evidence of ESD's effectiveness in developing young adolescents' ACiSD is scarce. Moreover, the studies that take on the challenge do not typically focus on the action-oriented character of ESD (Boeve-de Pauw et al., 2015; Olsson, Gericke, & Boeve-de Pauw, 2022). Students' perceptions of their teachers' ESD practices are typically not brought into focus when effectiveness research in this domain is performed (e.g. Boeve-de Pauw & Van Petegem, 2011). In line with insights that stakeholders – which are, amongst others, the students in this context – have to be involved in the assessment of teaching and learning (Mogensen & Schnack, 2010), the current research takes students' perceptions of their teachers' ESD approach into account. In line with Olsson et al.'s (2022) suggestion, we added students' experience of action-orientedness to their perception of teachers' holistic and pluralistic approach. The current study focuses on students' perceptions of their teachers' ESD implementation, and on whether that perception affects changes in students' ACiSD. The following research questions guided this study:

1. How do early adolescent students perceive their teachers' ESD implementation efforts?
2. Are early adolescent students' perceptions of their teachers' ESD implementation related to their ACiSD development?

Theoretical background

In this section we will focus on the main frameworks referred to in the current study and findings through earlier research. In our description of action competence in sustainable development (ACiSD) and education for sustainable development (ESD), we will highlight relevant similarities between ESD and learning science in a context of socio-scientific issues (SSI). Finally, a brief visit to earlier findings by Boeve-de Pauw et al. (2015) and Olsson et al. (2022) will guide hypothesis development for the current study.

Action competence in sustainable development (ACiSD)

Before elaborating on ACiSD, a short note on the concept of action is required. Jensen and Schnack (2006) define action as a behaviour that is voluntary and directed towards goal achievement that involves change. The goal to be achieved is to make a contribution to solving complex problems (also called issues) that incite controversy regarding how to solve them (Hungerford & Volk, 1990). An example of such controversial problems are sustainability issues (Sass et al., 2020). Action competence in sustainable development (ACiSD) consists of the relevant knowledge and skills, willingness, and self-efficacy (i.e. capacity expectations and outcome expectancy) regarding making a contribution towards solving sustainability issues (Jensen 2000; Mogensen & Schnack 2010; Sass et al. 2020). Next to knowledge about the sustainability issue's causes, core features, and effects, relevant knowledge also concerns knowledge of stakeholders and values of the action taker as well as of society (Jensen & Schnack, 2006; Jensen 2000; Oulton, Dillon, & Grace, 2004; Öhman, 2008), alongside knowledge of action possibilities (Breiting & Mogensen, 1999). Skills include critical thinking (Hasslöf & Malmberg, 2015; Oulton et al., 2004; Rudsberg & Öhman, 2010; UNESCO, 2017), problem-solving, and systems thinking (Ke et al., 2020; UNESCO, 2017), which are also paramount in science education (Sadler, Romine, & Topçu,

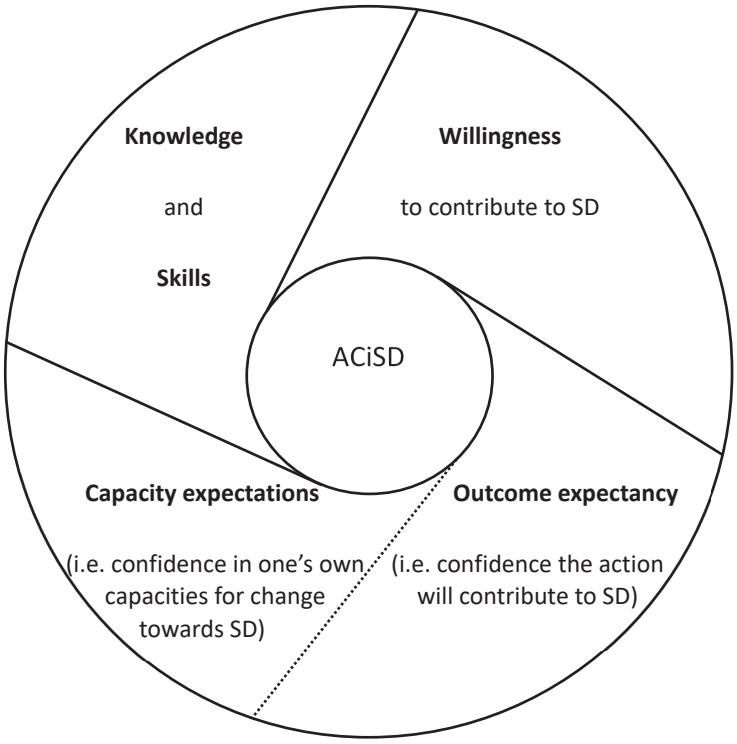


Figure 13. Core features of ACiSD (after Sass et al., 2020)

2016). Moreover, students should possess the communication skills that are necessary to enter in respectful discussions. They need to be capable of empathising with points of view that differ from their own. Moreover, they should be capable of explaining the evidence-based rationale, norms, and values that led to the construction of their own and others' (differing) perspectives (Newton & Zeidler, 2020; Rudsberg & Öhman, 2010). The willingness aspect of ACiSD is a motivational feature. If action takers are to be resistant to drawbacks and disappointment, a strong autonomous motivation such as passion is required (Jensen, 2000; Jensen & Schnack, 2006; Moeller & Grassinger, 2013; Sass et al., 2020). Finally, self-efficacy consists of the confidence in one's own capacities for taking action, i.e. capacity expectations, and in the impact of the action, i.e. outcome expectancy (Bandura, 1977; 2001). Figure 13 illustrates the concept of ACiSD.

Education for sustainable development (ESD) and social-science inquiry-based learning

Learning science in a context of socio-scientific issues (which we will further refer to as SSI) is an approach to science education that is closely related to ESD. In what follows, we will highlight the relevant features SSI and ESD have in common. We will do so by first examining the connection between science and the emergence of controversial issues that are at the core of action-taking. Secondly, we will discuss how ESD features of holism, pluralism, and action-orientedness are also present in SSI.

In their reconceptualisation of teaching controversial issues, Oulton et al. (2004) posit that scientific developments can give rise to both origins of and solutions to controversial problems. This resonates with the kind of issues action competence aims to solve in which there is controversy about how to reach possible solutions (Hungerford & Volk, 1990). This connection with SD issues manifests itself especially when scientific developments lead to different or even opposing social, economic, and/or political views on the desirability of its possible uses and consequences, as in the case of e.g. genetically modified crops (Oulton et al., 2004). As such, the issues that scientific development gives rise to are similar to SD issues with their intertwined environmental, social and economic features with origins in and consequences for local, regional, and global settings for past, present, and future generations (United Nations, 2015). In that sense, ESD and learning in a context of SSI are comparable, as both typically aim to find answers to controversial problems that require taking into account perspectives form different domains. Not surprisingly, both approaches to teaching can be considered similar, as ESD core features of holism, pluralism, and action-orientedness are present in SSI learning as well.

With its features of a holistic (Ke et al., 2020; Stables & Scott, 2002; Varela-Losada et al., 2016), pluralistic (Öhman, 2008), and action-oriented (Sinakou et al., 2019; Varela-Losada et al., 2016) approach, ESD is theoretically expected to enhance students' action competence (Breiting et al., 2009). Sustainability issues are complex, as they typically

consist of interrelated environmental, social, and prosperity related features across past, present, and future in a local, regional and global context (United Nations, 2015). Given this complexity, a holistic perspective to education is required in order to support students in developing systems thinking skills (Varela-Losada et al., 2016; Wiek et al., 2011; Wiek et al., 2011b; Wiek et al., 2015). This involves a multidisciplinary approach in which insights from different (social) scientific domains are taken into account when discussing how to work towards solving sustainability issues (Gustafsson & Warner, 2008; Ke et al., 2020). Moreover, in order to be(come) capable of contributing to solving controversial issues, students are required to understand the internal logic of different perspectives (Newton & Zeidler, 2020; Oulton et al., 2004). In the case of SSI learning, the need for holism is expressed in a combination of adherence to an evidence-based rationale while taking into account scientific as well as social aspects that may have caused an issue and/or can contribute to its solution. Therefore, teachers of different disciplines in secondary education are encouraged to cooperate in order to allow students to achieve a holistic perspective (Gericke et al., 2020; Knippels & van Harskamp, 2018). Pluralism refers to an openness to different perspectives on the same (SD) issue, which relates to a democratic approach to education (Hasslöf & Malmberg, 2015; Mogensen and Schnack, 2010; Rudsberg & Öhman, 2010). By means of deliberative discussions, it facilitates educational practices that may support students in developing an openness to different perspectives before making their own well-informed choices regarding how to (re)act to SD issues (Ottander & Simon, 2021; Rudsberg & Öhman, 2010). Consequently, it is through a pluralistic approach that students get the opportunity to take different perspectives into account, which is also required when the aim is to contribute to solving socio-scientific issues (Knippels and van Harskamp, 2018; Newton & Zeidler, 2020; Romine, Sadler, Dauer, & Kinslow, 2020). Moreover, next to encouraging a diversity of points of view, a pluralistic perspective involves a participative approach to teaching and learning (Gustafsson & Warner, 2008; Öhman, 2008), which ideally includes co-decisions of students and teachers on what should be learnt and how to approach that learning process. Students' active participation facilitates creative, yet inquiry-based problem-solving, when students (gradually) take over responsibility from the teacher (Gustafsson & Warner, 2008) by allowing their learning process to guide well-informed decision-making instead of merely accepting the authority of the teacher (Ke et al., 2020; Varela-Losada et al., 2016). Action-orientedness refers to the opportunities students get for pluralistic discussion as a prerequisite for individual and collective decision-making regarding possible SD actions. It involves encouragement to make explicit to their discussion partners what evidence-based knowledge, norms, and values guided students' decision-making process (Newton & Zeidler, 2020; Sass et al., 2020) when getting the opportunity to contribute to solving a real-world (local) SD issue they perceive as relevant (Sinakou et al., 2019). Furthermore, deliberative discussion can achieve creative solutions to SD issues and facilitate participatory learning by giving students room to express perspectives that diverge from what is commonly accepted. Thus, students' acquisition of control and responsibility from the teacher can facilitate active student participation (Gustafsson & Warner, 2008). Critical discussion and reflection on how the decision-making process and subsequent action

evolved may further enhance insight into what factors contributed to or hindered a successful outcome (Knippels & van Harskamp, 2018). Consequently, students and teachers can learn together what alternative ways would possibly be more fruitful to achieve the goals they set, which creates a more optimistic atmosphere and gives room to thinking in terms of possibilities rather than lost causes (Hasslöf and Malmberg 2015; Mogensen 1997; Sinakou et al. 2019). Action-orientedness is also present as a key element of socio-scientific inquiry-based learning (SSIBL). As Knippels and van Harskamp (2018) explained, the 'Act' feature follows posing authentic socio-scientific questions ('Ask') and exploring these through inquiry that integrates social and scientific traditions ('Find Out'). Ke et al. (2020) confirmed that also from the students' perception their experience with SSI learning promoted action-taking. In sum, we conclude that ESD features of holism, pluralism, and action-orientedness are also present in an approach to science education that integrates socio-scientific issues. In what follows, we will further refer to this educational approach as ESD for reasons of clarity. For a graphic representation of ESD and its features of holism, pluralism, and action-orientedness, we refer to Figure 14.

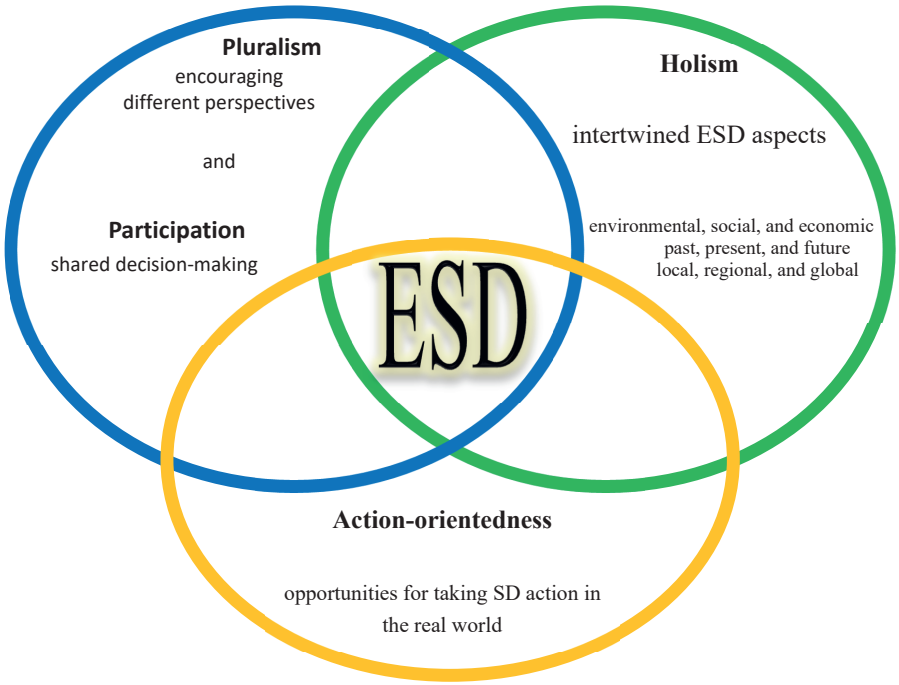


Figure 14. Core features of ESD (adapted from Sinakou et al., 2019)

Earlier ESD effectiveness research and hypotheses

Effectiveness studies in the field of ESD and environmental education have typically focused on learning outcomes within schools that did or did not achieve a certain label, such as 'eco-school' or 'green school' (Olsson et al., 2019; Shay-Margalit & Ofir, 2017). Research into the effects of certain educational approaches have long been missing. Although effectiveness research efforts into ACiSD as a learning outcome of ESD and its core features of holism, pluralism, and action-orientedness are scarce, two studies offer insight into what ESD features may affect what ACiSD components, i.e. knowledge and skills, willingness, capacity expectations, and outcome expectancy. In what follows, we will compare findings by Boeve-de Pauw et al. (2015) and Olsson et al. (2022) that guided hypothesis development for the current study.

Evidence from Boeve-de Pauw et al. (2015) suggested that a holistic approach to the learning content may especially facilitate students' knowledge about what is needed in order to achieve SD. A follow-up study (Olsson et al., 2022) confirmed this also for knowledge of SD action possibilities. In both studies, measurement of holism included attention to the interconnectedness between 1) environmental, social, and economic aspects of SD; 2) in present, past, and future; and 3) at a local, regional, and global level.

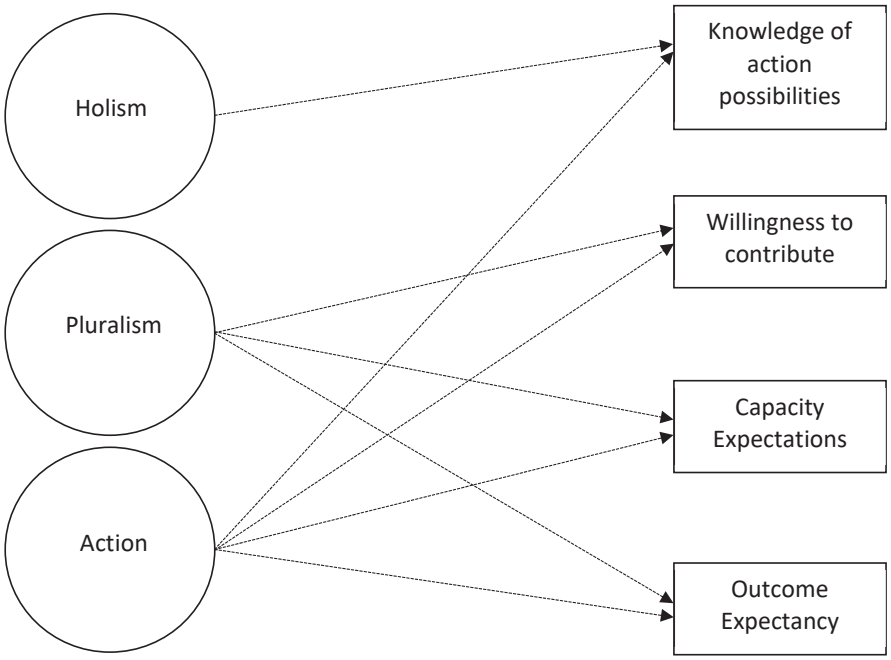


Figure 15. Graphical representation of hypothetical effects of ESD (holism, pluralism, and orientation towards action) on ACiSD (conceptual knowledge of action possibilities, willingness to contribute to SD, capacity expectations, and outcome expectancy)

Pluralism appeared to enhance students' self-reported sustainable behaviour (Boeve-de Pauw et al., 2015), and all features of ACiSD, i.e. knowledge of action possibilities and willingness to take action, but especially confidence in their own capacities for making an impact or outcome expectancy (Olsson et al., 2022). Contrary to Boeve-de Pauw et al. (2015), Olsson and colleagues (2022) also found that students' experience of pluralism affected the cognitive aspect of knowledge of action possibilities. Neither research included action-orientedness. However, if students get opportunities for trying out actions they designed for solving SD issues that are relevant to them, it stands to reason that this experience may strengthen their self-efficacy (i.e. capacity expectations and outcome expectancy) as this approach creates opportunities for success experiences (Bandura, 1977; 2001). Based on the evidence described in this section, we arrive at the following hypotheses regarding our second research question (see Figure 15): students' experiences with ESD will affect their ACiSD positively. Regarding ESD features, students' experience with

1. holism will especially enhance students' knowledge
2. pluralism will predominantly strengthen their willingness, capacity expectations, and outcome expectancy
3. action-orientedness will facilitate knowledge, willingness, capacity expectations, and outcome expectancy

Method

In what follows, we will first present the sample of participants to the current study. Next, we will provide a brief introduction to the instruments used for measuring independent (student perceptions of ESD and its features) and dependent variables (ACiSD and its features of knowledge, willingness, capacity expectations, and outcome expectancy). We will conclude this section with an account of analytic strategies that guided our research in order to answer the two research questions.

Sample

Fifteen schools participated in the current study at two measurement moments, one at the beginning (M0) and one at the end (M1) of the schoolyear. For answering the first research question, 440 participants of which 227 were male, 208 female, and five chose not to disclose their gender, filled in the questionnaires at M1. They were students in 60 class groups at grades 7 (n = 318) and 8 (n = 122), i.e. the first two years of secondary education. They were between twelve and sixteen years old with an average age of 12.88.

As the second research question aimed to control for initial levels of ACiSD, only students who had filled in the questionnaires both at the beginning and end of the schoolyear were involved. They were a total of 416 participants, of which 218 were male, 192 female, and

six did not disclose their gender. They were students in 59 class groups of which 304 and 112 in grades 7 and 8 respectively. They were between eleven and fifteen years old (average age = 12.22).

The 15 schools whose students completed the questionnaires, were all involved in the VALIES project (Valorising Integrated and Action-Oriented Education for Sustainable Development at School), which aimed to facilitate ESD implementation in primary and secondary schools in Flanders, Belgium. Regardless of a few exceptions, schools typically took part in the research with one or two class groups.

Measures

Two instruments were used to answer the current study's research questions. Firstly, we developed a scale to measure students' perceptions of their teachers' ESD implementation efforts. The pluralism (ten items) and holism (three items) subscales were inspired by instruments developed by Boeve-de Pauw et al. (2015) and Olsson et al. (2022). Five items were added that tapped into action-orientedness. Holistic approaches to SD were measured with a focus on 1) intertwined environmental, social, and peace aspects, 2) connections between past, present, and future in 3) local, regional, and global contexts. Next to statements regarding different perspectives (five items), the pluralism scale referred to participative approaches to teaching (five items). Measurement of action-orientedness took into account opportunities for exploration in and beyond the school and at home, collaboration, and personal initiative. For an overview of all initial items, we refer to Table A7 (in Appendix 6). For measuring the students' ACiSD we used the ACiSD-Q, an extensively validated instrument (Sass et al., 2021). This 36-item instrument includes subscales tapping into ACiSD features conceptual knowledge of action possibilities, willingness to contribute, capacity expectations, and outcome expectancy regarding actions for the environment (three 'planet' items), social (three 'people' items), and peace issues (three items). See Tables A4 and A5 for the English and Dutch versions, respectively (Appendix 4).

Before answering our research questions, we verified the quality of both measurement instruments (ESD perceptions and ACiSD-Q) and looked into how well they fitted our data. Reliability (Cronbach's alphas for overall constructs and subconstructs) and construct validity (robust CFA) were verified. Estimations were based on robust CFA in order to respect the categorical character of the items for ESD perception and ACiSD-Q as they were all rated on a five-point Likert scale. Therefore, diagonally weighted least squares estimation was used for reaching accurate model estimations (Mîndrilă, 2010). Cut-off values ≤.08 (SRMR and RMSEA), and ≥.95 (CFI and TLI) were deemed indicative of good fit (Brown 2015).

The scale tapping into ESD feature 'introducing different perspectives' and one reversed item in the participation scale ('At my school only the teacher decides what classes are about') were problematic in terms of reliability. Deletion of the ESD items involved resulted in a reliable ESD-perception measurement instrument that consisted of subscales participation, holism, and action-orientedness. For both measurement instruments, tapping into students' ESD-perception and ACiSD, Cronbach's alphas were .86 and .93, respectively. Values at ESD subconstruct level ranged between .76 for participation and .84 for holism. Alphas between .75 (for capacity expectations) and .85 (outcome expectancy) were found for the ACiSD subconstructs. Construct validity was verified through robust CFA, which yielded acceptable to excellent model fit for perceived ESD (CFI: 0.959; TLI: 0.947; RMSEA: 0.097; SRMR: 0.060) and ACiSD-Q (CFI: 0.987; TLI: 0.971; RMSEA: 0.033; SRMR: 0.020). We refer to Table 15 for a more detailed overview of the final 12-item ESD-perception measurement instrument, which consisted of subscales participation (four items), holism (three items), and action-orientedness (five items). More details regarding the ACiSD-Q can be found in Table A8 in Appendix 6.

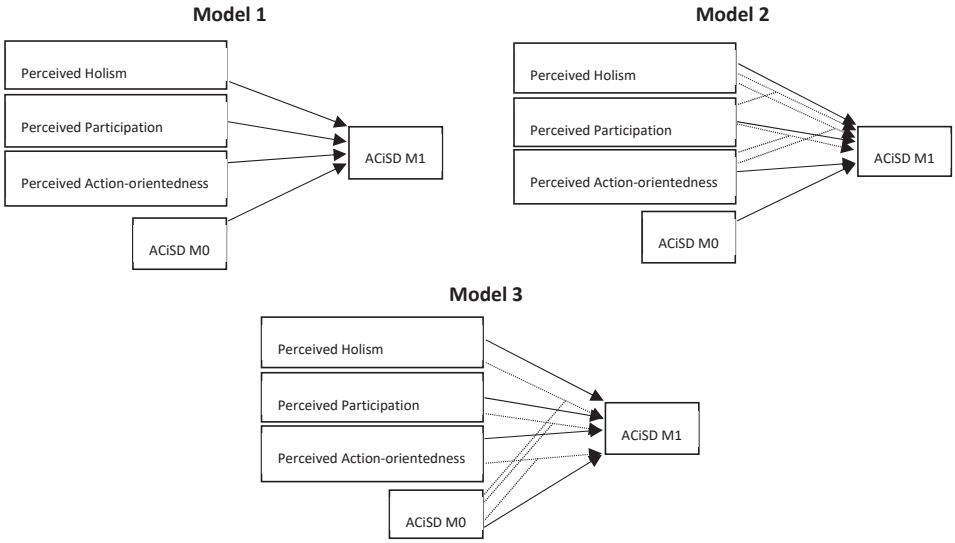


Figure 16. Graphical representation of Models 1, 2, and 3 for dependent variable ACiSD at M1

Analytic strategies

In order to answer our first research question, we calculated means and standard deviations for all items, subconstructs, and overall perceived ESD. This enabled us to describe the participating students' experience with their teachers' ESD approach in terms of holism, participation, and orientation towards action. For answering the second research question, we acknowledged the nested structure of the data, as answer patterns of

students in the same class group are likely to be more similar to each other than compared to those of students in different class groups. Therefore, multilevel linear models were implemented to account for the fact that observations were not independent (Hox et al., 2017). Different models were assessed for estimating the effects of participation, holism, and an orientation towards action on overall ACiSD, conceptual knowledge of action possibilities, willingness to contribute to SD actions, capacity expectations, and outcome expectancy regarding the SD actions. All models controlled for initial scores on ACiSD or its subconstructs at the beginning of the schoolyear (M0). For each of these models, we compared null models to models for main effects only (Models 1), models that included interactions between ESD subconstructs participation, holism, and action-orientedness (Models 2), and models that included interactions with the ESD subconstructs and students' initial scores at M0, i.e. the beginning of the schoolyear (Models 3). The three models are graphically presented for outcome variable ACiSD in Figure 16.

All analyses in this research were performed using RStudio version 4.1.1. with packages psych (Revelle, 2021) for answering research question one and preliminary verification of reliability of the scales. Furthermore, package lavaan (Rosseel, 2012) was used for performing robust CFA, and packages lme4 (Bates et al., 2015) and lmerTest (Kuznetsova et al., 2017) for multilevel linear model estimations and significance tests, respectively.

Results

As explained in the method section, our perceived ESD measurement instrument consisted of an action-oriented, holistic, and furthermore a purely participative instead of a pluralistic approach to ESD, for reasons of reliability. Consequently, for answering the first research question, we calculated mean scores and standard deviations for students' perceptions of overall ESD, participative, holistic, and action-oriented teaching approaches and for their overall ACiSD, conceptual knowledge of action possibilities, willingness to contribute, capacity expectations, and outcome expectancy regarding SD actions. As can be seen in Table 15, the participating students' perceptions of their teachers' ESD approach was low, especially regarding participation (means = 2.24; SD = 0.80), for which answers tended towards "I don't agree". Their experience of holism (means = 3.16; SD = 0.82) and action-orientedness (means = 3.10; SD = 0.75) were slightly higher. Overall ESD as well as its features of participation, holism, and action-orientedness were perceived close to the neutral centre of the five-point Likert scale ("I don't agree and don't disagree"). In sum, in the students' perceptions, the teachers educational approach did not completely lack any ESD components, but they were not really convincingly felt to be present either. Especially a participative approach was rather felt to be missing.

As for ACiSD, the participating students showed highest agreement with statements regarding conceptual knowledge (means = 4.14; SD = 0.52) and outcome expectancy (means = 4.08; SD = 0.63), although closely followed by capacity expectations (means =

3.96; SD = 0.57), and willingness (means = 3.92; SD = 0.63). Also see Table A8 in Appendix 6 for an overview of means and standard deviations of all items.

Table 15. Students' perceptions of their teachers' ESD implementation (inspired by Boeve-de Pauw et al., 2015 and Olsson, Gericke, & Boeve-de Pauw, 2022), 5-point Likert scales with a neutral centre, with mean scores, standard deviations (SD), and Cronbach's alphas, and model fit indices of robust CFA

Student perceptions	**Item label and Cronbach's α**	**Item**	**Descriptives**	
			means	**SD**
ESD (12 items)	**α = 0.86**		**2.83**	**0. 63**
Participation	**α = 0.76**	***At our school…***	**2.24**	**0.80**
	Participation 1	…students can choose what we learn about.	1.83	1.02
	Participation 2	…the teacher takes into account what the students are interested in when choosing a class topic.	2.75	1.16
	Participation 3	…I, the teacher, and my classmates determine together what we learn about.	1.72	0.89
	Participation 4	…teachers ask the students' opinion on how we approach a lesson.	2.67	1.08
Holism	**α = 0.84**	***At our school…***	**3.16**	**0.82**
	Holism1	…I learn about the connections between what things used to be like in the past, what they are like now, and what they will be like in the future.	3.07	0.92
	Holism2	…I learn about how problems here with us and global problems are connected.	3.16	0.98
	Holism3	…I learn about how the environment, people, and peace here and elsewhere in the world are connected.	3.24	0.94
Action	**α = 0.82**	***My school encourages me to…***	**3.10**	**0.75**
	Action1	…go and explore outside the school as well.	2.95	1.05
	Action2	…collaborate on actions for a good life for everyone without damaging the planet.	3.23	0.95

	Action3	…learn what I can do at school to contribute to a good life for everyone without damaging the planet.	3.42	0.93
	Action4	…learn what I can do at home to contribute to a good life for everyone without damaging the planet.	3.31	0.95
	Action5	…organise an action for a good life for everyone without damaging the planet.	2.61	1.07
Model fit after robust CFA	CFI = 0.959	TLI = 0.947	RMSEA = 0.097	SRMR = 0.060

For answering the second research question, which looked into possible effects of ESD and its subconstructs on students' ACiSD and its features, we looked into different models as described in the method section. Table 16 summarizes the model fit and model comparison statistics for the different models applied to the different dependent variables. Except for deviance, all measures of fit indicated that the most parsimonious models (Models 1), including only main effects of ESD subconstructs on ACiSD or its features, consistently fitted our data best (lowest AIC and BIC). Therefore we report on the results of this model 1 in the following section.

We here report on the five different models 1, i.e. the main effects of ESD features holism, participation, and action-orientedness on 1) overall ACiSD, 2) conceptual knowledge of action possibilities, 3) willingness, 4) capacity expectations, and 5) outcome expectancy. As shown in Table 17, especially action-orientedness appeared to positively affect overall ACiSD (+0.11; SE = 0.03; $p<0.001$) and all its subconstructs statistically significantly. Its effect was largest on outcome expectancy (+0.18; SE = 0.04; $p<0.001$) and willingness (+0.10; SE = 0.04; $p<0.05$) and smallest on conceptual knowledge of action possibilities (+0.09; SE = 0.04; $p<0.05$) and capacity expectations (+0.08; SE = 0.04; $p<0.05$). Apart from the positive effect of holism on capacity expectations (+0.12; SE 0.04; $p<0.001$), no other statistically significant effects were found.

Table 16. Model fit (AIC and deviance) and model comparison statistics (difference in deviance; difference in number of degrees of freedom; and p-value for the difference in deviance based on the -2LL ratio test) of multilevel models for each of the dependent variables. Null model, Models 1 (main effects of perceived ESD features), Models 2 (added interactions between features of ESD to Models 1), and Models 3 (added interactions of ESD features with ACiSD or its subconstructs at M0 to Models 1)

Dependent variable	Model	AIC	deviance	Δ deviance	Δ df	*p*-value
ACiSD	Null Model	587.47	581.47			
	Model 1*	413.04	399.04	182.43	4	< 0.001
	Model 2**	414.83	394.83	4.21	3	0.24
	Model 3***	418.51	398.51	0.53	3	0.91
Conceptual Knowledge	Null Model	640.06	634.06			
	Model 1*	540.96	526.96	107.11	4	< 0.001
	Model 2**	544.66	524.66	2.3	3	0.51
	Model 3***	545.73	525.73	1.23	3	0.75
Willingness	Null Model	787.79	781.79			
	Model 1*	603.27	589.27	192.52	4	< 0.001
	Model 2**	603.57	583.57	5.70	3	0.13
	Model 3***	607.54	587.54	1.73	3	0.63
Capacity Expectations	Null Model	702.36	696.36			
	Model 1*	583.44	569.44	126.91	4	< 0.001
	Model 2**	587.85	567.85	1.59	3	0.66
	Model 3***	588.97	568.97	0.47	3	0.93
Outcome Expectancy	Null Model	787.26	781.26			
	Model 1*	701.14	687.14	94.12	4	< 0.001
	Model 2**	700.68	680.68	6.46	3	0.09
	Model 3***	702.61	682.61	4.54	3	0.21

*Note on comparisons of deviance between models: * = comparing Null Model to Model1; ** = comparing Model 1 to Model 2; *** = comparing Model 1 to Model 3*

Table 17. Parameter estimates (standard errors) of Models 1, i.e. effects of perceived ESD features participation, holism, and action-orientedness on ACiSD and its features of conceptual knowledge, willingness, capacity expectations, and outcome expectancy at M1, after controlling for the effect of initial scores (at M0)

	ACiSD		Conceptual knowledge		Willingness		Capacity expectations		Outcome expectancy	
	Est. (SE)	*p*-value	Est. (SE)	*p*-value	Est. (SE)	*p*-value	Est. (SE)	*p*-value	Est. (SE)	*p*-value
Intercept	1.36 (0.18)	<0.0001	1.97 (0.20)	<0.0001	1.09 (0.18)	<0.0001	1.75 (0.19)	<0.0001	2.04 (0.21)	<0.0001
M0-score	0.54 (0.04)	<0.0001	0.44 (0.04)	<0.0001	0.60 (0.04)	<0.0001	0.42 (0.04)	<0.0001	0.35 (0.05)	<0.0001
Participation	-0.01 (0.03)	0.65	-0.03 (0.03)	0.30	0.01 (0.04)	0.86	-0.02 (0.04)	0.52	-0.07 (0.04)	0.08
Holism	0.06 (0.03)	<0.05	0.04 (0.03)	0.20	0.06 (0.04)	0.13	0.12 (0.04)	<0.001	0.07 (0.04)	0.08
Action	0.11 (0.03)	<0.001	0.09 (0.04)	<0.05	0.10 (0.04)	<0.05	0.08 (0.04)	<0.05	0.18 (0.04)	<0.0001

Discussion, limitations, and suggestions for future research

ESD and environmental education effectiveness studies typically focused on learning outcomes within schools that obtained certification as e.g. 'green school' (Olsson et al., 2019; Shay-Margalit & Ofir, 2017). Whereas the few previous studies on ESD effectiveness focused on components holism and pluralism, the current study added an orientation to action as a third feature of ESD. Our results indicate that action-orientedness positively affects changes in students' ACiSD, and enhances their belief in the impact of SD actions in particular. First, we looked into students' perceptions of their teachers' implementation of ESD with its holistic, participative, and action-oriented approaches to education. Our evidence showed that the students did not experience clear-cut incidence of ESD or any of its components. Especially statements "At our school students can choose what we learn about" and "I, the teacher, and my classmates determine together what we learn about" were disagreed with. We wonder if the low levels of perceived participation may explain why we did not find any statistically significant effect of it on ACiSD in the current study. Consistent with findings by Boeve-de Pauw and colleagues (2015) and Olsson et al. (2022), especially evidence of a participative approach were felt to be absent in the students' perceptions, whereas mild indications of action-orientedness and holism appeared to be present. This seems in line with evidence suggesting that teachers often find they lack inspiring models and feel ill-prepared for taking on the challenge of implementing a multi-faceted, and therefore demanding, approach such as ESD in their educational practice (Borg et al., 2012; Taylor et al., 2019; Boeve-de Pauw, Olsson, Berglund, & Gericke, 2022).

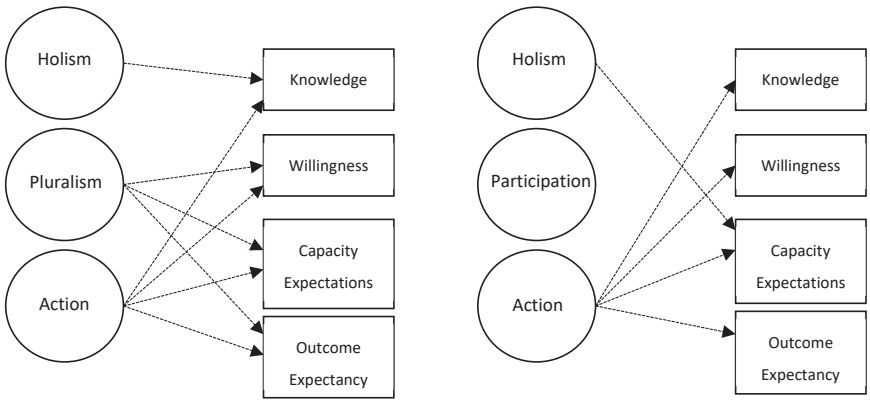


Figure 17. Graphical representation of hypothetical effects (left) and effects found in the current study (right) of ESD (holism, pluralism or participation, and orientation towards action) on ACiSD (conceptual knowledge of action possibilities, willingness

Secondly, we studied whether ESD and its components of holism, participation, and action-orientedness enhanced students' ACiSD (Figure 17). Notably, our evidence showed a statistically significant effect of perceived action-orientedness on students' development of ACiSD as well as all its features of conceptual knowledge of SD actions, willingness to act,

capacity expectations, and outcome expectancy. Furthermore, the newly added feature of action-orientedness may have caused the non-significance of effects of participation and (with the exception of capacity expectations also the effects) of holism. Therefore, our evidence did not confirm our first two theory-based hypotheses that

(1) holism would especially enhance students' knowledge;

(2) pluralism would predominantly strengthen their willingness, and capacity expectations.

Instead, we found a statistically significant effect of holism on capacity expectations. However, results found in this study, confirm hypothesis

(3) action-orientedness will facilitate knowledge, willingness, capacity expectations, and outcome expectancy.

This sheds new light on Olsson et al.'s (2022) findings that students' outcome expectancy was not affected by teachers' ESD implementation efforts in terms of holistic and pluralistic approaches. Moreover, our evidence confirms their hypothesis that being offered opportunities for action-taking would foster students' belief that their actions have an impact on SD (outcome expectancy). Whereas Olsson et al. (2022) suggested that shared power and decision-making (i.e. participation) would possibly hone students' confidence in their own impact on SD, our results highlight the importance of an action-oriented approach for facilitating such outcome expectancy development. Future research should further study how action-oriented teaching affects students' confidence in the impact of SD actions. Unlike previous research, our results did not show evidence of any statistically significant impact of holism and participation, with the exception of a positive effect of holism on capacity expectations. Possibly, the added ESD component of action-orientedness drew significance away from the other two ESD features, i.e. participation and holism. Our evidence could not confirm Olsson et al.'s (2022) findings that pluralism would enhance students' confidence in the impact of their actions. This may be due to differences in the way this feature was measured. The current study focused on student participation in terms of co-decision on learning content and approach, whereas Olsson and colleagues (2022) measured pluralism as consisting of a participative approach and a focus on different perspectives. Moreover, they focused on 17 to 19-year-old students, which were older than the participants, aged 10 to 14, in the current study. Boeve-de Pauw et al. (2015) also found age-related differences in the effects of pluralism on students' sustainability behaviour. This led them to conclude that younger students (e.g. 11 to 12-year-olds) could not yet cope with the relatively low level of structured instruction inherent in ESD approaches. Consequently, future research may want to further investigate the two

aspects of pluralism and their impact on students' ACiSD development across different age brackets.

As all research, also the current study suffered from a number of limitations that open avenues for further research. Firstly, data collection was hampered by the effects of the Covid-19 pandemic, which reduced our sample size (n = 440 for the first research question and 416 for the second). This may have led to power problems which possibly impeded more statistically significant effects of holistic and participative teaching. Moreover, this may have prevented us from using more complex models that would have allowed to find differences in effects according to the students' initial scores (at M0). In future studies, larger datasets should shed more light on the effects of holism and pluralism on students' ACiSD building in an action-oriented ESD approach. Moreover, further investigation is warranted into possible interaction effects of ESD components with initial levels of ACiSD, knowledge of action possibilities, willingness to contribute, capacity expectations, and outcome expectancy. Secondly, we relied on quantitative data only, which did not enable us to dig deeper into the 'why' and 'how' of the effects found. Qualitative methods, such as focus groups, class observations, and interviews with students and teaching teams could complement our findings.

Regardless of the limitations described above, we are confident that we contributed to ESD effectiveness research by adding the feature of action-orientedness to ESD components holism and pluralism that were studied earlier. Our evidence confirmed the possible merits of an orientation towards action in ESD and SSI learning.

Implications for education and teacher training

Since the current study revealed that students seem to miss signs of ESD implementation in the secondary classroom, and teachers indicate they feel ill-equipped for taking on this formidable task (Borg et al., 2012; Taylor et al., 2019), adequate teacher training both at pre- and in-service level is required. Lately, promising evidence from research in different national contexts indicated that continuing professional development programmes show evidence of positive effects both on teachers' self-efficacy, their development and adoption of adequate pedagogies for sustainable development (Murphy, Smith, Mallon, & Redman, 2020; Redman, Wiek, & Redman, 2018), and consequently fosters students' sustainability competences (Murphy et al., 2021; Redman et al., 2021). International cooperation and research on what factors support teaching teams' ESD implementation efforts can give them access to inspiring examples (Borg et al., 2012; Evans, Stevenson, Lase, Ferreira, & Davis, 2017; Taylor et al., 2019). Features of the teacher development programme that were observed as crucial were a focus shift from content to competences, solution-oriented modelling of teacher sustainable behaviour that occurred during their implementation practice, and a longer duration and frequency of the contact moments. As Redman et al. (2021, p. 10/13) concluded:

> *"By lengthening the CPD, teachers experimented with implementation **during** the program and received support both explicitly (answering questions) to implicitly (a community of support for experimentation)."* [emphasis by Redman et al., 2021]

Furthermore, teachers may benefit from participating in learning communities that focus on ESD implementation (Avalos, 2011; Isac et al., 2022). In order to facilitate structural co-learning of teachers, teachers should be guarded from impediments such as overcrowded curricula and the burden of too many administrative tasks (Taylor et al., 2019).

Conclusion

Different from previous research that looked into the effectiveness of certain (certified) ESD and environmental education programmes, such as 'green schools', we set out to study the effects of an ESD approach to teaching. Answering calls for more attention to action-orientation in ESD implementation efforts (Sinakou et al., 2019; Varela-Losada et al., 2016), we found evidence for the theory-based claim that action-oriented ESD may foster action competence in sustainable development within early adolescent students. We added a focus on action-orientedness to ESD features of holism and pluralism, which had been the focus of previous studies (Boeve-de Pauw et al., 2015; Olsson et al., 2022). Our results suggest that action-orientedness positively impacts changes in students' ACiSD. Especially students' confidence in the impact of SD actions was enhanced by an action-oriented approach. We conclude that our evidence supports the claim that an action-oriented educational approach is effective. Our findings may encourage secondary school teaching teams to take on the challenge of implementing action-oriented approaches to ESD, knowing that their efforts may enhance their students' action competence in sustainable development.

Acknowledgements

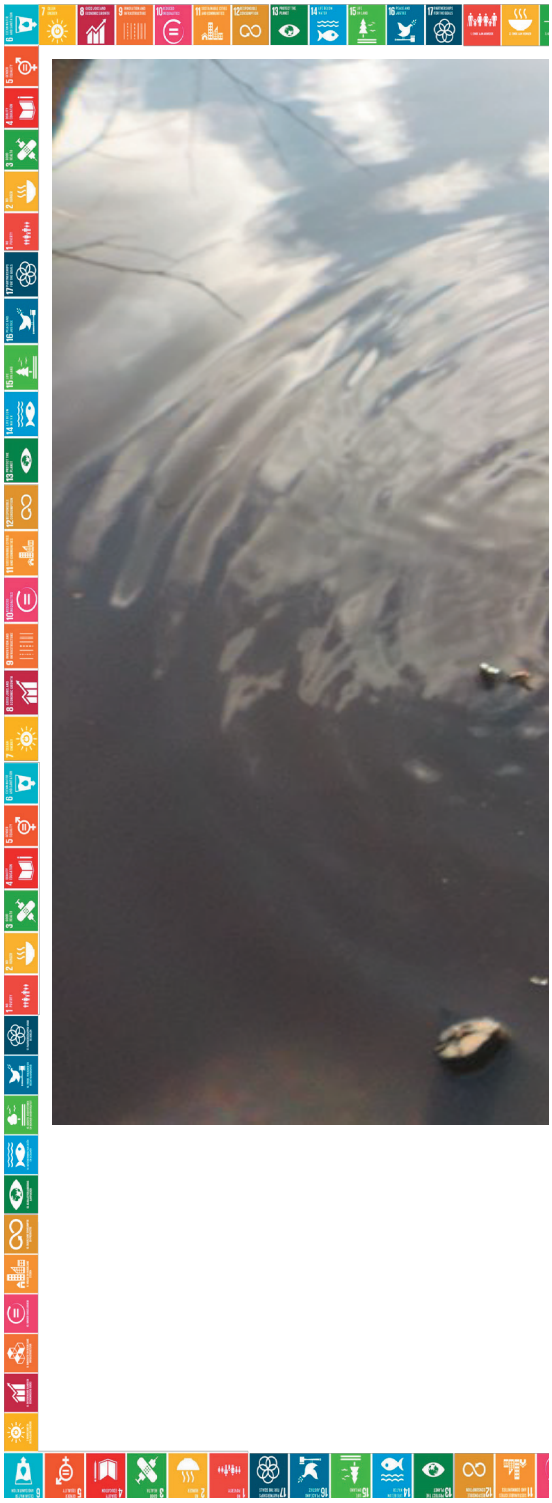
The authors would like to thank all participating schools and respondents for their constructive cooperation and feedback. We are also grateful for the help of all working students and colleagues involved in the data collections and digitalisation of the paper questionnaires.

Chapter 7

Discussion and conclusions

Chapter 7

Action is urgent in view of current sustainability issues such as climate change and equity problems. Education is viewed as a tool for equipping future generations with the necessary action competence. Therefore, this dissertation set out to disentangle the confusion arisen from different interpretations of the concept of action competence. We operationalised action competence as a generic competence of individuals and groups for contributing to solving controversial problems such as sustainable development issues. The resulting instrument, i.e. the ACiSD-Q, for measuring early adolescents' action competence in sustainable development, was used to find out whether formal education at classroom level matters and if teachers' holistic, pluralistic, and action-oriented approach affects changes in their students' ACiSD. In this final chapter we ponder on what the research presented in this dissertation achieved, as well as its limitations and constraints. We also provide suggestions for further research and sketch implications for (educational) practice and policy.



Discussion and conclusions

"There is no precious thing like earth so we need to protect it.
Development, albeit in the long run;
tightening the belts by reducing overconsumption
domestic production without polluting the environment
would be provided by living like a human."

Elifnaz Türeyen (15, Turkey, 2022)

Findings, limitations, and discussion

In view of the urgency for action regarding sustainability issues, the current dissertation focused on students' action competence as a learning outcome of education for sustainable development (ESD). We set out to disentangle the confusion surrounding the concept of action competence, redefining it as a competence of (groups of) people (study 1, Chapter 2). Based on this operationalisation and early adolescents' suggestions for actions they felt to be feasible for someone their age (study 2, Chapter 3), we operationalised action competence in sustainable development and developed a measurement instrument, the ACiSD-Q (study 3, Chapter 4). In studies four and five (Chapters 5 and 6) the ACiSD-Q was used to establish the impact of what happens in classrooms, and the connection between teachers' ESD implementation and students' ACiSD development, respectively. We took early adolescents' perspectives into account by developing the ACiSD-Q in collaboration with ten to fourteen-year-old students. Therefore, a sequential mixed-method approach was adopted with qualitative research preceding quantitative studies. We aimed to address three gaps that were identified at the onset of the research presented in this dissertation. Firstly, we developed a clear (re)definition of the action competence concept as a generic competence of (groups of) individuals and exemplified it in the context of sustainable development as action competence in sustainable development (ACiSD). Secondly, based on the novel redefinition of action competence and early adolescents' suggestions for SD actions, a questionnaire instrument was developed, the ACiSD-Q, that allowed monitoring of ESD implementation efforts. Thirdly, evidence-based research was initiated to verify theoretic claims that education for sustainable development is a suitable educational approach for fostering students' action competence. Especially an action-oriented ESD approach to teaching was found to affect early adolescents' ACiSD development. Figure 1 graphically presents aims, research questions and methodology that guided the five studies this dissertation consists of.

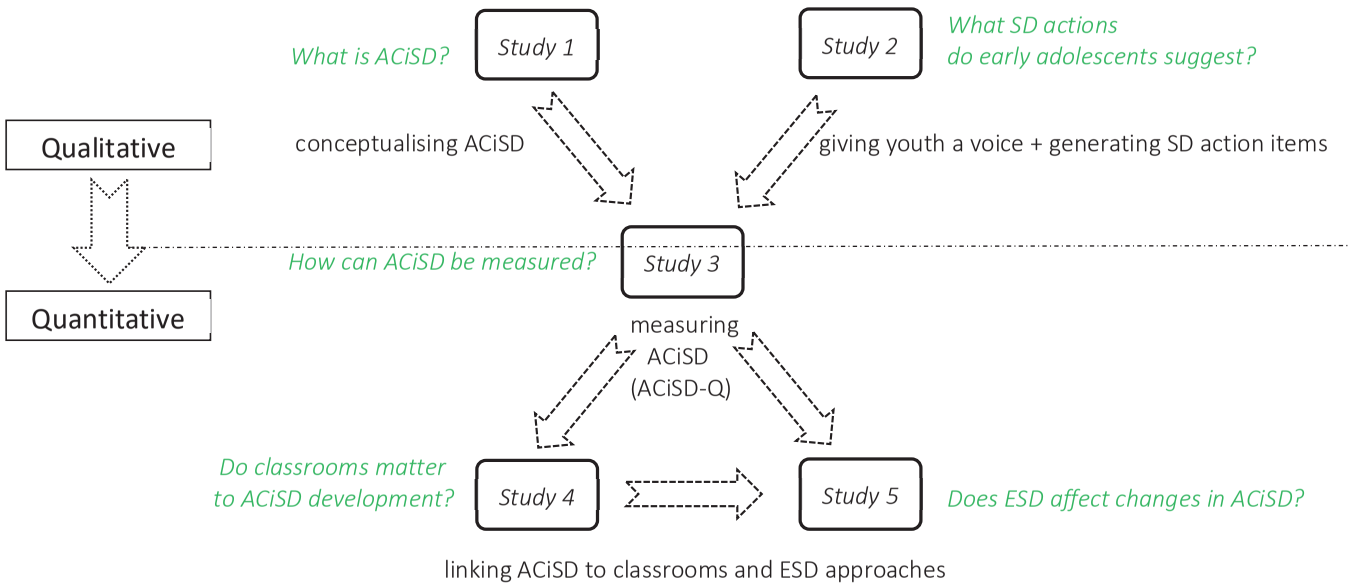


Figure 1. Overview and flow of the five studies with their aims (in black) and main research questions (in green)

Contributions of this dissertation

Untying the knot in the discussion concerning the concept of AC

Our first aim was to disentangle the confusion in the literature regarding what action competence is. Therefore, a further conceptualisation of action competence was needed. We redefined action competence (see Figure 3) as a generic competence of (a group of) people in the context of a problem they feel needs solving while different, even opposing, paths for doing so are put forward. We contributed to the research field by defining the action competent person as

someone who is committed and passionate about solving a societal issue, has the relevant knowledge about the issue at stake as well as about the democratic processes involved, takes a critical but positive stance towards different ways for solving it, and has confidence in their own skills and capacities for changing the conditions for the better.

Relevant knowledge includes knowledge of origins, effects, stakeholders and core features of the issue to be solved, action possibilities for contributing to a solution, one's own and societal norms. Skills involve critical thinking, flexibility, creative envisaging of future situations, and a positive stance to alternative perspectives and suggestions for solutions. Willingness consists of a strong autonomous motivation for contributing, i.e. passion, and commitment, which includes intent, long-term goal-setting, and identification with the issue. Capacity expectations concern confidence in one's own capacities for change. Outcome expectancy relates to confidence that the action (to be) taken will contribute to solving the issue, or in other words confidence in one's own influencing possibilities. This new definition was exemplified in the context of the quest for finding solutions to sustainable development issues as *action competence in sustainable development, i.e. ACiSD* (Study 1; Chapter 2).

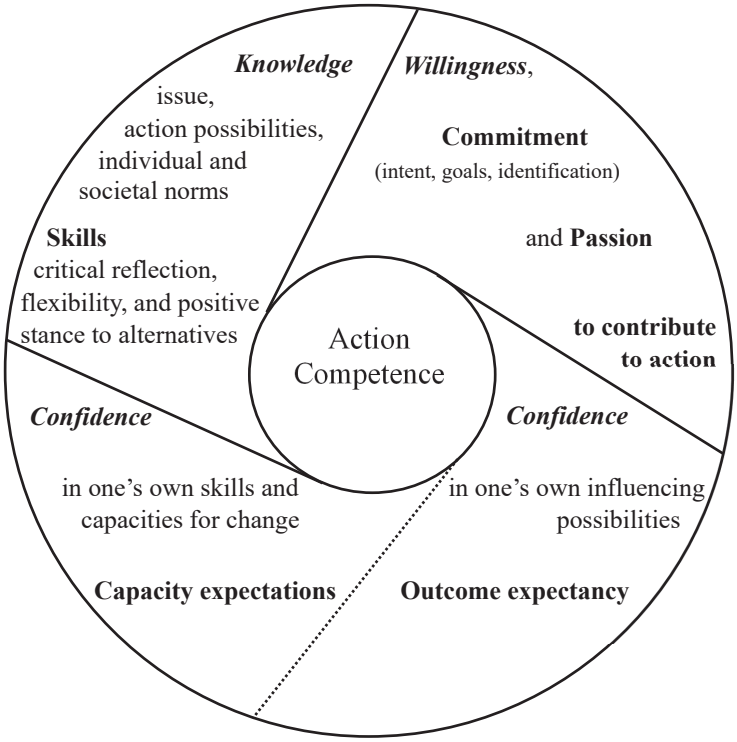


Figure 3. Core features for an action competent individual as generically redefined in this study

Two years after the start of the current doctoral research, Shephard, Rieckmann, and Barth (2019) observed another ambiguity in the concepts and terms used in the ESD literature. They posited that the multidisciplinary nature of the ESD research field had led to various different understandings of terms such as 'competence' and 'capability' and called for clear definitions of these terms for the research field to advance. With the redefinition of 'action competence', we clarified what we understood action competence to be in the studies that make up this dissertation. We did so starting from the Danish seminal manuscripts on action competence (e.g. Breiting et al. 1999, republished in English in 2009) and additionally drawing from motivation theories such as Bandura's (2001) work on self-efficacy, Ryan and Deci's (2000) self-determination theory, Vallerand's passion (2015) framework, and Moeller and Grassinger's (2013) commitment-passion or Comm.Pass framework. Consequently, we included motivational aspects next to traditional competence components such as knowledge and skills in the ecology of psychological concepts underpinning action competence. Our redefinition of action competence as a generic concept proved fruitful in domains other than environmental, sustainability, and health education, as it was cited in e.g. research on sex education (Biström, 2021) and professional competences of teachers regarding ESD implementation (Sass, Claes et al.,

2022; Isac et al., 2022). In the context of environmental and sustainability education, Öhman & Sund (2021) connected our redefinition of action competence to teacher practice, developing a didactic framework that includes sustainability commitment, while Sund and Gericke (2021) embraced action competence as a learning outcome of a teaching approach that aims at enabling students to face future, and often yet unknown, SD challenges.

Making action competence measurable

The second aim of this dissertation was to operationalise the concept of action competence and to make it measurable. Based on the redefined concept of action competence in sustainable development, i.e. ACiSD, a questionnaire was developed in co-creation with early adolescents in order to make it measurable as a student learning outcome. This resulted in a novel reliable and thoroughly validated instrument, co-developed with early adolescents (Chapter 4): *the action competence in sustainable development questionnaire, i.e. the ACiSD-Q*.

The questionnaire distinguishes itself in three ways from the scarce instruments that were developed earlier for measuring action competence or similar concepts. Firstly, it is based on the concept of action competence in sustainable development as redefined in the first study (Chapter 2). Secondly, it made use of concrete actions for sustainable development, while, thirdly, taking early adolescents' view on feasible actions for sustainable development by using their own suggestions for actions to generate the items used in the questionnaire. In doing so, we contributed by complementing the few existing measurement instruments such as Gericke et al.'s (2019) Sustainability Consciousness Questionnaire (SCQ) and Olsson et al.'s (2020) Self-Perceived Action Competence for Sustainability Questionnaire (SPACS-Q).

Investigating whether teachers' education for sustainable development approaches affect students' ACiSD development

The third aim of this dissertation concerned the question of whether teachers' education for sustainable development approaches affect students' ACiSD development. In the fourth study (Chapter 5), we made use of the newly developed ACiSD-Q to verify the importance of the classroom level for early adolescent students' action competence in sustainable development. We found that the classroom level matters, explaining between 7.2% and 14.2% of variance in ACiSD (11%) and its components, which is in line with findings concerning learning outcomes at a purely cognitive level. At the end of one schoolyear, individual students as well as class groups in primary and secondary schools (grades 5 to 8) showed higher average ACiSD scores compared to the beginning. Moreover, students and class groups with lower initial scores had gained more than those with higher scores at the beginning of the schoolyear. The results of this study established that the classroom level matters to students' ACiSD development. However, it did not yet shed light on whether and what aspects of the teachers' ESD approaches would contribute to this positive

evolution in their students' ACiSD. Consequently, now that the importance of the classroom level had been ascertained, we moved on to find out whether and what aspects of teachers' ESD approaches would enhance their students' ACiSD development (Chapter 6). Although students reported low levels of perceived ESD, our results showed that an orientation towards action contributes to an increase in students' overall ACiSD and all of its components. Especially early adolescents' confidence in the impact of actions for sustainability (outcome expectancy) appears to benefit from an orientation towards action.

With the last two studies in this dissertation (described in Chapters 5 and 6), we contributed to the field of educational effectiveness research by adding ACiSD as a learning outcome. Thus we broadened this field's focus, that typically looked into cognitive attainment outcomes in subjects such as mathematics, science, and language, or targeted social and affective outcomes related to health matters such as wellbeing (Chapman et al., 2016). With this contribution, we answered Kelly and Clarke's (2016) call for introducing learning outcomes regarding sustainable development in educational effectiveness research. We established the usefulness of measurement instruments such as the ACiSD-Q for monitoring and informing ESD implementation efforts, as was deemed necessary by policy makers (UNESCO, 2017). In doing so, we also contributed to the first steps in the field towards measuring students' perceptions of their teachers ESD practices, adding action-orientedness to Olsson et al.'s (2022) measurement of ESD in terms of holism and pluralism. Moreover, we found that social-science-inquiry-based teaching approaches to science education were comparable to ESD implementation in terms of components holism, pluralism, and an orientation towards action (see e.g. Knippels & van Harskamp, 2018). This may indicate that action-oriented ESD and approaches to science education that acknowledge its embeddedness in social contexts have evolved towards similar insights. Seemingly, positions taken with regard to the place of scientific inquiry in an action competence approach to teaching in initial discussions regarding the concept (Bishop & Scott, 1998; Breiting & Mogensen, 1999) could be moving closer to each other. Finally, our results highlight the importance of an action-oriented approach to ESD, in which students get opportunities for performing the actions they deem necessary, which is in line with findings reported in Manni and Knekta's (2021) qualitative study, which they summarised as "A little less conversation, a little more action please".

Giving voice and listening to early adolescents

Taking an emancipatory stance, an overall aim of the current dissertation was not only to give early adolescents a voice, but also to listen to them. Therefore, we first asked students what actions for sustainable development they found most needed and feasible for someone their age (Chapter 3). The early adolescent participants to this qualitative study suggested a rich variety of actions for contributing to solving environmental, social, peace, and to a lesser extent also prosperity issues. They were keen to set up actions independently as well as in partnership with others. Suggestions included individual, collective, direct, and indirect actions in the private and public sphere.

Furthermore, we took the participants' perspectives into account, using their suggestions for actions to generate an initial item pool when developing the action competence in sustainable development questionnaire (ACiSD-Q; Chapter 4). The resulting instrument was used for listening to the early adolescents on a larger scale in order to find out whether the classroom level mattered to their ACiSD development (Chapter 5) and if their teachers' action-oriented ESD approach affected it (Chapter 6). Again, we involved the students' perspectives, listening to their perceptions of the teachers' action-oriented ESD approaches, but in this instance through quantitative methods.

In sum, students' perspectives were honoured through qualitative (Chapter 3) and quantitative methods (Chapters 4 to 6). Their views were taken into account regarding actions for sustainable development (Chapter 3) and the teachers' ESD practices (Chapter 6).

Limitations and suggestions for further research

In the previous section we summarised this dissertation's merits. Still, new findings give rise to new intriguing questions, and all research is bound by limitations and constraints that need acknowledgement. In what follows we discuss these and suggest how they may inspire future research.

Limitations and future avenues for further research at the conceptual level

At the onset of this dissertations' research, the need for a clear (re)definition of action competence was our first focus point. We distinguished the concept from democratic approaches to teaching, such as education for sustainable development (ESD), redefining it as a generic competence of (groups of) people. We continued with an elaboration of action competence that targets sustainability issues, which was believed to be a learning outcome of ESD. A further development of instruments for measuring (students' perceptions of their) teachers' ESD practices is advisable. First steps were taken by Olsson et al. (2022) who looked into teachers' ESD implementation in terms of a holistic and pluralistic approach, and in this dissertation's fifth study (Chapter 6) that added an orientation towards action as a third ESD component. Our validation of subscale 'pluralism' indicated that ESD component 'allowing different perspectives' in terms of consulting students' opinions, was hampered by reliability issues. This points towards the need for further scrutiny of pluralism which might be interpreted as consisting of two subcomponents, i.e. taking different perspectives into account on the one hand, and active participation of students in teaching-learning dynamics on the other hand. Furthermore, the interplay between the three components merits scholarly attention. Seemingly, an orientation towards action may have drawn statistical significance away from the holistic and pluralistic aspects of ESD. One hypothesis could be that providing students with opportunities for engaging with real-world issues is a necessary requirement for them to fully experience the benefits of a holistic and pluralistic approach. Next to quantitative

research based on larger samples, also qualitative studies could verify this hypothesis through observation, semi-structured interviews, and focus group discussions with teachers and students.

Furthermore, our operationalisation of the concept and consequent development of the ACiSD-Q limited the knowledge and skills component to conceptual knowledge of action possibilities. Future investigations into knowledge of personal and societal norms, and problem-solving, creative, enquiry-based, systems, and critical thinking skills could further advance action competence research. In times when terms such as "fake news" and "alternative truths" see the light, critical thinking skills seem essential if well-informed decision-making is at stake. This takes us back to 1997, when Mogensen put critical thinking forward as a central element for action competence development in health and environmental education. Taking into account the sense of urgency that surrounds sustainable development issues and the relative ease with which personal opinions and assumptions are communicated as undeniable facts through certain (social) media channels, more insight into this feature of action competence is warranted. Finally, the action competence feature of willingness may merit deeper insight in terms of passion and commitment, elaborating on Moeller and Grassinger's (2013) insight into its components, i.e. strong personal motivation, intent, long-term goal setting, and identification with the issue.

Other choices can further be explored in order to verify whether action competence can be fruitful in other domains than sustainability, health, and environmental education, that involve issues in which opposing interests lead to different perspectives on possible solutions. Examples that spring to mind are climate change education, global citizenship education (also see Menzie-Ballantyne & Ham, 2021), and domains that focus on e.g. political decision-making competences, or teachers' professional competences regarding ESD implementation (see e.g. Sass, Claes, et al., 2021; Isac et al., 2022).

Methodological strengths and constraints

As our aim was explorative (looking into the 'what' of ACiSD and ESD), we opted for an overall sequential multi-method design, which is appropriate for exploring real-world phenomena regarding education (Creswell & Creswell, 2018; Teddlie & Tashakkori, 2009). In a next step could be opted for a parallel multi-method approach in order to find answers to the 'how' and 'why' of students' ACiSD and its connection with their teachers' ESD practices (Teddlie & Tashakkori, 2009). In a parallel multi-method approach the same phenomena are looked into simultaneously through qualitative and quantitative lenses. When further investigating the connections between ESD features of holism, pluralism, and action-orientedness, students could communicate their individual perceptions of teachers' ESD implementation through filling in questionnaires, while focus group discussions could reveal how they experience ESD collectively, as they can react to each other and clarify why they feel certain features of ESD are either present or missing. Likewise, when studying

critical thinking skills, for example, quantitative methods could ask students to compare different perspectives regarding possible solutions to a certain sustainability issue, weighing credibility of the source that suggests them. Concurrently, collective sense-making could be observed through focus group discussions during which participants additionally provide the rationale that leads them to trust one source rather than another.

Furthermore, we developed the ACiSD-Q in co-creation with the intended population of early adolescents. This allowed us to take an emancipatory stance by taking the students' own perspectives into account. However, the initial item pool we generated was situated in a specific time and space. We wonder whether the youthful participants would come up with similar focus points and actions for sustainable development now, when they are experiencing a pandemic and have witnessed the first horrific consequences of climate change through extensive floods with dozens of citizens losing their homes in Western Europe, including the South of Belgium, rather near to their homes (for coverage see Cable News Network, 18 July 2021). Additionally, students of the same age in a different culture may view the same issues and possible solutions differently. In other words, next to a cross-cultural validation of the ACiSD-Q, a replication of this dissertation's second and third studies (Chapters 3 and 4) would be an interesting way of finding out about expiring date and cultural specificity of early adolescents' perspectives on and suggestions for sustainable development actions (Ariza et al., 2021; Olsson et al., 2019).

The VALIES context in which this dissertation's research unfolded, offered opportunities as well as constraints. This context was convenient for sampling when collecting data. Apart from the qualitative second study (Chapter 3) where purposive sampling furnished our data outside the VALIES context, we opted for convenience sampling in the schools that participated in the VALIES project as a data collection method for quantitative studies 3 to 5 (Chapters 4 to 6). This enabled data collection of larger samples, necessary for performing complex statistical analyses for which a higher level of statistical power of the data is required. However, it may have biased results regarding estimates of students' ACiSD and their ESD perceptions, as all participating students attended school in establishments that took part in a project dedicated to ESD implementation, i.e. the VALIES project. This may have led to an underestimation of the variance in ACiSD between class groups and individual students. Further research may want to opt for a data collection method that would yield more representative data of the early adolescent student population.

Implications for educational practice and policy

As the studies presented in this dissertation were positioned as strategic basic research, we hope our findings will be useful to educational practice as well as furthering the academic field. In this regard, we will offer our views on how our work could be used by early adolescent students, their teachers and school teams, policymakers, and curriculum developers.

Students have shown the merits of a participative approach through the much valued contributions they made to our qualitative study (Chapter 3) and the consequent development of the ACiSD-Q (Chapter 4). It is our hope that this may enhance their confidence. Our findings may encourage them not only to form their own well-informed opinions, but also to keep (or start) using their voice in matters of sustainable development and their own teaching-learning trajectory regarding action competence. After all, next to older generations' it is first and foremost their future that is at stake.

As research evidence suggests teachers often indicate they feel ill-equipped for implementing a demanding and complex approach to teaching such as ESD (Boeve-de Pauw et al., 2022), they can find inspiration in the class materials developed for study 2 (see Appendices 1, 2, and www.edoschool.be), which may support them in adopting a holistic, multi-perspective, and participative approach to ESD practices. The materials can be used to initiate actions in the real (local) world. Whereas our research focused on students' knowledge, willingness, and confidence, teachers can take it one step further and provide students with room for performing the actions they come up with either individually or, preferably, collectively. Thus, they can add an orientation towards real action as advocated by Sinakou et al. (2019) and the participants to Manni and Knekta's study (2020). Alongside other (quantitative and) qualitative instruments, such as class observations, focus groups, and interviews with students and colleagues, the ACiSD-Q can be added to teachers' and schools' tool kits for monitoring their ESD implementation efforts. Its added value lies in the information it can offer on changes in students' ACiSD if average results from measurements at different moments throughout one or more schoolyears are compared. We advise to use the ACiSD-Q as an instrument for formative rather than summative evaluation, as the latter would thwart the notion of students' and teachers' (co)development in a democratic teaching-learning context, inherent in the concepts of action competence and ESD. Additionally, teachers and school teams could use the results from measurements with the ACiSD-Q to decide on focus points for ACiSD development in accordance with the school's mission. When the aim is to further develop knowledge and skills, starting from a relevant real-world issue may offer teachers and students a fruitful context for designing appropriate actions. This could enhance skills such as critical thinking, systems thinking (when involving cross-disciplinary perspectives), communication of factual as well as ethical factors taken into account, envisaging the future, and creative problem-solving. Meanwhile, this offers opportunities for enquiry-based learning when science education is deemed useful for designing appropriate actions. Willingness to contribute to action may be fostered through acknowledging needs for autonomy, relatedness, and competence (Deci & Ryan, 2000). By giving room to students' preferences and initiative in the selection of the sustainability issue to be resolved and the design of the action to be taken, students' need for autonomy and relatedness with the issue are respected. Cooperation with peers and teachers would add opportunities for caring and feeling cared for, while the experience may support confidence in their personal and collective capacities for change and in positive outcomes of action, i.e. self-efficacy. Furthermore, role models among peers (and teachers) and others' belief in their capability

for designing and performing action would additionally strengthen students feelings of competence (Bandura, 1977; 2001; 2005). Finally, teachers and school teams can use the questionnaire on ESD-perceptions (Chapter 6) to gain insight in students' perceptions of their ESD practices in terms of a holistic, participative, and action-oriented approach. Students' experiences may complement teachers' own and their colleagues' formative assessment of their ESD practices. This may support teachers' professional development and monitoring efforts regarding their action-oriented ESD approach, comparing their personal evaluation of ESD implementation efforts to the students' experiences.

Teacher professional development policy is advised to invest in continuing professional development programmes to improve teachers' self-efficacy, their development and adoption of adequate pedagogies for sustainable development (Murphy et al., 2020; Redman et al., 2018). A focus on competences should provide teachers with opportunities to implement and subsequently reflect on the (newly adopted) ESD practices in the course of frequent meetings over a longer period of time (Redman et al., 2021). Furthermore, teachers may benefit from participating in learning communities that focus on ESD implementation (Avalos, 2011; Isac et al., 2022) and should be provided plenty of opportunities for collaboration across different subjects with their typical teaching traditions (Borg et al., 2012). Finally, in order to facilitate structural co-learning of teachers, teachers should be guarded from impediments such as overcrowded curricula and the burden of too many administrative tasks (Taylor et al., 2019).

Finally, curricula should provide enough room for cross-curricular and action-oriented educational efforts if schools are to support students' ACiSD development. As teachers and school teams indicate they feel challenged and ill-equipped for implementing action-oriented ESD approaches to learning and teaching (Borg et al., 2012; Isac et al., 2022), policymakers should clearly indicate where and how the curricula offer opportunities for fostering ACiSD through ESD, and what skills are common to different subjects and can, therefore, best be focused on across different subjects and through a collaboration among different (subject) teachers.

General conclusions and key findings

The findings of the current dissertation contribute to the literature on action competence as a learning outcome of education for sustainable development. We set out to redefine the concept of action competence, to make it measurable, and to study the effectiveness of action-oriented ESD practices for early adolescent students' development of action competence (in sustainable development), while respecting students' perspectives.

We studied action competence as a learning outcome of education for sustainable development, redefining action competence as a generic competence of (groups of) individuals. This new conceptual understanding of action competence was exemplified with

a focus on sustainable development issues and made measurable through a reliable and valid questionnaire instrument, the ACiSD-Q, which was developed in co-creation with early adolescents. Students' action competence in sustainable development was found to improve in the course of one schoolyear, supporting the theoretic assumption that the classroom level matters. Finally, our evidence suggested that especially an action-oriented approach to education for sustainable development may enhance students' ACiSD development, which was a first step towards adding action competence as a new learning outcome within educational effectiveness research.

In sum, this dissertation established the importance of ESD to early-adolescent students' ACiSD development. Our findings underscored the challenges teaching teams are confronted with when implementing such open and democratic teaching and learning approaches. Evidence found in the current dissertation confirms assumptions in the fields of research and policy that action-oriented ESD is a suitable approach for equipping students with sustainability competences, so they may be better prepared to face (and mitigate?) current and future sustainability challenges.

Key findings

- Someone is action competent (in sustainable development) when they
  - are committed and passionate about solving a societal (e.g. SD) issue,
  - have the relevant knowledge about the issue at stake as well as about democratic processes, and take a critical but positive stance towards different ways for solving it,
  - have confidence in their own skills and capacities for taking action, and
  - have confidence that the action will contribute to changing conditions for the better.
- Action competence in sustainable development (ACiSD) can be measured.
- Education for sustainable development (ESD) is a suitable democratic educational approach for fostering ACiSD.
- An action-oriented approach to ESD is particularly suited for supporting early adolescent students' ACiSD development.
- Even though implementing ESD in schools and teacher practice is complex and challenging, teachers and school teams may find courage in the assurance that their efforts pay off.

With these contributions, we hope to have thrown a pebble in the pond. The limitations and constraints that also defined our research may inspire new ripples of enquiry. New questions will lead to more profound insights into how education for sustainable development can support early adolescents and their teachers in their search for what is needed to make their local and/or global community more sustainable. Current and future generations may yet get the opportunity to live a good life in harmony with nature without exhausting this beautiful blue planet that we all cherish one way or another.

…and here this journey endjoys moving on towards new horizons with plenty of pebbles waiting to be thrown in yet another pond…

Because we couldn't live without water,
because without air there would never be.
Because our "faithful earth" was sacred.
There is no precious thing like earth so we need to protect it.
Development, albeit in the long run;
tightening the belts
by reducing overconsumption
domestic production
without polluting the environment
would be provided by living like a human.

Elifnaz Türeyen
(15, Turkish Youth Environmental Education Congress ambassador)

Author contributions

Chapter 2: Redefining action competence - The case of sustainable development

Sass, W.: conception of the study, setup of the method, drafting and revision of the manuscript, article reviewing and editing before and after submission, proof correction for publication

Boeve-de Pauw, J..: feedback on the study conception and method, critical feedback on the manuscript

Olsson, D.: feedback on the study conception, critical feedback on the manuscript

Gericke, N.: feedback on the study conception, critical feedback on the manuscript

De Maeyer, S.: feedback on the study conception and method, critical feedback on the manuscript

Van Petegem, P.: feedback on the study conception and method, critical feedback on the manuscript

Chapter 3: Actions for sustainable development through young students' eyes

Sass, W.: conception of the study, setup of the method, data acquisition, set-up of data analysis, data analysis, drafting and revision of the manuscript, article reviewing and editing before and after submission, proof correction for publication

Quintelier, A.: data analysis, critical feedback on set-up of data analysis and the manuscript

Boeve-de Pauw, J..: feedback on the study conception and method, critical feedback on the manuscript

De Maeyer, S.: feedback on the study conception and method, critical feedback on the manuscript

Gericke, N.: critical feedback on the manuscript

Van Petegem, P.: critical feedback on the manuscript

Chapter 4: Development and validation of the action competence in sustainable development questionnaire (ACiSD-Q)

Sass, W.: conception of the study, setup of the method, data acquisition, set-up of data analysis, data analysis, drafting and revision of the manuscript, article reviewing and editing before and after submission, proof correction for publication

Boeve-de Pauw, J..: feedback on the study conception and method, data acquisition, critical feedback on data analysis and the manuscript

De Maeyer, S.: feedback on the study conception and method, set-up of data analysis, critical feedback on data analysis and the manuscript

Van Petegem, P.: critical feedback on the manuscript

Chapter 5: Honing Action Competence in Sustainable Development - What happens in classrooms matters

Sass, W.: conception of the study, setup of the method, data acquisition, set-up of data analysis, data analysis, drafting and revision of the manuscript, article reviewing and editing before and after submission, proof correction for publication

De Maeyer, S.: feedback on the study conception and method, set-up of data analysis, critical feedback on data analysis and the manuscript

Boeve-de Pauw, J..: feedback on the study conception and method, data acquisition, critical feedback on data analysis and the manuscript

Van Petegem, P.: critical feedback on conception of the study and the manuscript

Chapter 6: Perceived Education for Sustainable Development Practices and Students' Action Competence in Sustainable Development

Sass, W.: conception of the study, setup of the method, data acquisition, set-up of data analysis, data analysis, drafting and revision of the manuscript, article reviewing and editing before and after submission, proof correction for publication

De Maeyer, S.: feedback on the study conception and method, set-up of data analysis, critical feedback on data analysis and the manuscript

Boeve-de Pauw, J..: feedback on the study conception and method, data acquisition, critical feedback on data analysis and the manuscript

Van Petegem, P.: critical feedback on the manuscript

References

Aguilar, O. (2018) Toward a theoretical framework for community EE. *The Journal of Environmental Education, 49*(3), 207-227. doi: 10.1080/00958964.2017.1397593

AHOVOKS. (2021). *Onderwijsdoelen lager onderwijs [Educational goals primary education]*. Retrieved from https://onderwijsdoelen.be

Alderson, P. (2008). Children as researchers. In P. Christiansen & A. James (Eds.), *Research with Children: Perspectives and Practices* (276-290). New York and London: Routledge.

Almers, E. (2013). Pathways to action competence for sustainability—Six themes. *The Journal of Environmental Education, 44*(2), 116-127. doi: 10.1080/00958964.2012.719939

Amézaga, T. R. W., Camarena, J. L., Figueroa, R. C., & Realivazquez, K. A. G. (2021). Measuring sustainable development knowledge, attitudes, and behaviors: evidence from university students in Mexico. *Environment, Development and Sustainability,* 1-24. doi: 10.1007/s10668-021-01467-0

Amoah, A., & Addoah, T. (2021). Does environmental knowledge drive pro-environmental behaviour in developing countries? Evidence from households in Ghana. *Environment, Development and Sustainability, 23*(2), 2719-2738. doi: 10.1007/s10668-020-00698-x

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

Arendt, H. (1958). *The Human Condition Second Edition.* Chicago and London: The University of Chicago Press.

Ari, E., & Yılmaz, V. (2017). Effects of environmental illiteracy and environmental awareness among middle school students on environmental behavior. *Environment, development and sustainability, 19*(5), 1779-1793. doi: 10.1007/s10668-016-9826-3

Ariza, M.R., Boeve-de Pauw, J., Olsson, D., Van Petegem, P., Parra, G., Gericke, N. (2021). Promoting Environmental Citizenship in Education: The Potential of the Sustainability Consciousness Questionnaire to Measure Impact of Interventions. *Sustainability 13*, 11420. doi: 10.3390/su132011420

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

Avalos, B. (2011). Teacher Professional Development in Teaching and Teacher Education over Ten Years. *Teaching and Teacher Education, 27*(1), 10–20. doi:10.1016/j.tate.2010.08.007

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi: 10.1037/0033-295x.84.2.191

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*, 1-26. doi: 10.1146/annurev.psych.52.1.1

Bandura, A., (2005). Adolescent development from an agentic perspective. In F. Pajares, & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents* (pp. 1-43). Information Age Publishing, Greenwich, CT.

Baptista, M., Reis, P., & de Andrade, V. (2018). Let's save the bees! An environmental activism initiative in elementary school. *Visions for Sustainability, 9,* 41-48. doi: 10.13135/2384-8677/2772

Barrella, E.; Spratto, E.P.; Pappas, E.; Nagel, R. (2018). Developing and validating an individual sustainability instrument with engineering students to motivate intentional change. *Sustainability, 10,* 2885. doi: 10.3390/su10082885

Bates, D., Mächler, M., Bolker, B. M., & Walker, S. C. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software, 67*(1), 1-48. doi: 10.18637/jss.v067.i01

Belgisch Staatsblad (2019, April 26). *Decreet betreffende de onderwijsdoelen voor de eerste graad van het secundair onderwijs*, 40558- 40830. Retrieved from https://www.ejustice.just.fgov.be/mopdf/2019/04/26_1.pdf#Page38

Berglund, T., & Gericke, N. (2018). Exploring the role of the economy in young adults' understanding of sustainable development. *Sustainability, 10,* 1-17. doi: 10.3390/su10082738

Berglund, T., 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. doi: 10.1080/02635143.2014.944493

Biesta, G. (2009a). What kind of citizenship for European higher education? Beyond the competent active citizen. *European Educational Research Journal, 8*(2), 146-158. doi: 10.2304/eerj.2009.8.2.146

Biesta, G. (2009b). Good education in an age of measurement: On the need to reconnect with the question of purpose in education. *Educational Assessment, Evaluation and Accountability*, *21*(1), 33–46. doi: 10.1007/s11092-008-9064-9

Biesta, G. (2015). What is education for? On good education, teacher judgement, and educational professionalism. *European Journal of Education*, *50*(1), 75–87. doi: 10.1111/ejed.12109

Bishop, K., & Scott, W. A. H. (1998). Deconstructing action competence: developing a case for a more scientifically-attentive environmental education. *Public Understanding of Science, 7*, 225 – 236. doi: 10.1088/0963-6625/7/3/002

Biström, E. (2021). Action competence for sustainable sexuality: an analysis of Swedish lower secondary level textbooks in biology and religious education. *Sex Education*. doi: 10.1080/14681811.2021.1966408

Boeve-de Pauw, J., Gericke, N., Olsson, D., & Berglund, T. (2015). The Effectiveness of Education for Sustainable Development. *Sustainability, 7*, 15693-15717. doi: 10.3390/su71115693

Boeve-de Pauw, J., Olsson, D., Berglund, T., & Gericke, N. (2022). Teachers' ESD self-efficacy and practices: A longitudinal study on the impact of teacher professional development. *Environmental Education Research.*
doi: 10.1080/13504622.2022.2042206

Boeve-de Pauw, J., & Van Petegem, P. (2011). The Effect of Flemish Eco-Schools on Student Environmental Knowledge, Attitudes, and Affect. *International Journal of Science Education, 33*(11), 1513-1538. doi: 10.1080/09500693.2010.540725

Boeve-de Pauw, J., & Van Petegem, P. (2013) The effect of eco-schools on children's environmental values and behaviour. *Journal of Biological Education, 47*(2), 96-103. doi: 10.1080/00219266.2013.764342

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

Borg, C., Gericke, N., Höglund, H.O., Bergman, E. (2012) The Barriers Encountered by Teachers Implementing Education for Sustainable Development: Discipline Bound Differences and Teaching Traditions. *Research in Science & Technological Education, 30*(2), 185–207. doi:10.1080/02635143.2012.699891

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. (1999/2009). *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. doi: 10.1080/0305764990290305

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

Cable News Network (2021, July 18). *Enormous scale of destruction is revealed as water subsides after historic western Europe flooding*. Retrieved from: https://edition.cnn.com/2021/07/18/europe/western-europe-floods-sunday-intl/index.html

Chapman, C., Muijs, D., Reynolds, D., Sammons, P., & Teddlie, C., (Eds.) (2016). *The Routledge International Handbook of Educational Effectiveness and Improvement.* London, New York: Routledge.

Chapman, C., Reynolds, D., Muijs, D., Sammons, P., Stringfield, S., & Teddlie, C. (2016). Educational effectiveness and improvement research and practice: The emergence of the discipline. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie, (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 1-24). London and New York: Routledge.

Chawla, L. (1999). Life Paths Into Effective Environmental Action. *The Journal of Environmental Education, 31*(1), 15-26. doi: 10.1080/00958969909598628

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., Bartlett, S., Driskell, D., Hart, R., & Olofsson, G. (2006). The missing population at the 2006 World Urban Forum. *Environment and Urbanization, 18*(2), 537-542. doi: 10.1177/0956247806070977

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

Cincera, J., Kroufek, R., Simonova, P., Broukalova, L., Broukal, V., & Skalík, J. (2017). Eco-School in kindergartens: the effects, interpretation, and implementation of a pilot program. *Environmental Education Research, 23*(7), 919-936. doi: 10.1080/13504622.2015.1076768

Činčera, J., Skalík, J., and Binka, B. (2018). One world in schools: an evaluation of the human rights education programme in the Republic of Georgia. *Cambridge Journal of Education*, 1-18. doi: 10.1080/0305764X.2018.1427216

Clark, C.R. (2016). Collective action competence: an asset to campus sustainability. *International Journal of Sustainability in Higher Education, 17*(4), 559-578. doi: 10.1108/IJSHE-04-2015-0073

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

Connell, S., Fien, J., Sykes, H., & Yenken, D. (1998/2014). Young people and the environment in Australia: beliefs, knowledge, commitment and educational implications. *Australian Journal of Environmental Education, 30*(1), 78–87. Journal Compilation. doi: 10.1017/aee.2014.28

Connell, S., Fien, J., Lee, J., Sykes, H., & Yenken, D. (1999). If It Doesn't Directly Affect You, You Don't Think About It': a qualitative study of young people's environmental attitudes in two Australian cities. *Environmental Education Research, 5*(1), 95-113. doi: 10.1080/1350462990050106

Cook, J. (2016). Young adults' hopes for the long-term future: from re-enchantement with technology to faith in humanity. *Journal of Youth Studies, 19*(4), 517-532. doi: 10.1080/13676261.2015.1083959

Cook, J. et al. (2016). Consensus on consensus: a synthesis of consensus estimates on human-caused global warming. *Environmental Research Letters, 11*(4). doi: 10.1088/1748-9326/11/4/048002

Corral-Verdugo, V., Lucas, M. Y., Tapia-Fonllem, C., & Ortiz-Valdez, A. (2019). Situational factors driving climate change mitigation behaviors: The key role of pro-environmental family. *Environment, Development and Sustainability, 22,* 7269–7285. doi: 10.1007/s10668-019-00496-0

Creswell, J.W. (2007). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches (second edition).* Thousand Oaks, CA: Sage Publications.

Creswell, J.W., & Creswell, J.D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Los Angeles: Sage.

Creswell, J.W., & Poth, C.N. (2018). *Qualitative inquiry and research design: Choosing among five approaches (fourth edition).* Thousand Oaks, CA: Sage Publications.

Davies, D., & Dodd, J. (2002). Qualitative research and the question of rigor. *Qualitative Health Research, 12*(2), 279-289. doi: 10.1177/104973230201200211

Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior, *Psychological Inquiry, 11*(4), 227-268. doi: 10.1207/S15327965PLI1104_01

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

Erdogan, M., Ok, A., & Marcinkowski, T.J. (2012). Development and validation of Children's Responsible Environmental Behavior Scale. *Environmental Education Research, 18*(4), 507-540. doi: 10.1080/13504622.2011.627421

European Commission (2019). *Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions – The European Green Deal* (COM(2019) 640 final). European Commission. Retrieved from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019DC0640&from=EN

European Commission/EACEA/Eurydice. (2020). *Compulsory Education in Europe – 2020/21. Eurydice Facts and Figures.* Luxembourg: Publications Office of the European Union. Retrieved from https://www.sel-gipes.com/uploads/1/2/3/3/12332890/2020_-__eurydice_-_compulsory_education_in_europe_2020-21.pdf

European Network for Environmental Citizenship – ENEC. 2018. Defining "Environmental Citizenship". Retrieved from: http://eneccost.eu/our-approach/enec-environmental-citizenship/

Evans, N.S. Stevenson, R.B. Lasen, M. Ferreira, J.A. Davis, J. (2017) Approaches to Embedding Sustainability in Teacher Education: A Synthesis of the Literature. *Teaching and Teacher Education, 63*, 405–417. doi:10.1016/j.tate.2017.01.013

Fisher, S.R. (2016). Life trajectories of youth committing to climate activism. *Environmental Education Research, 22*(2), 229-247. doi: 10.1080/13504622.2015.1007337

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

Gericke, N., Boeve-de Pauw, J., Berglund, T., & Olsson, D. (2019). The Sustainability Consciousness Questionnaire: The theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development. *Sustainable Development, 27*(1), 35–49. doi: 10.1002/sd.1859

Gericke, N., Huang, L., Knippels, MC., Christodoulou, A., Van Dam, F., Gasparovic, S. (2020). Environmental Citizenship in Secondary Formal Education: The Importance of Curriculum and Subject Teachers. In: Hadjichambis A. et al. (eds) *Conceptualizing Environmental Citizenship for 21st Century Education.* Environmental Discourses in Science Education, vol 4. Springer, Cham. doi: 10.1007/978-3-030-20249-1_13

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

Goot, M. (2011). Climate scientists and the consensus on climate change: the Bray and von Storch surveys, 1996-2008.

Gustafsson, B., & Warner, M. (2008). Participatory learning and deliberative discus-sion within education for sustainable development. In J. Öhman (Ed.), *Values and democracy in education for sustainable development: Contributions from Swedish research* (pp. 75-92). Malmö: Liber.

Hadjichambis, A.C., Reis, P. (2020) Introduction to the Conceptualisation of Environmental Citizenship for Twenty-First-Century Education. 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* (pp. 1-14). Cham, Switzerland: Springer International Publishing.

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* (pp. 69-82). Cham, Switzerland: Springer International Publishing. doi: 10.1007/978-3-030-20249-1

Hasslöf, H., & Malmberg, C. (2015). Critical thinking as room for subjectification in education for sustainable development. *Environmental Education Research, 21*(2), 239-255, doi: 10.1080/13504622.2014.940854

Hattie, J. (2009). *Visible Learning. A synthesis of over 800 meta-analyses relating to achievement.* London and New York: Routledge.

Henn, M., & Foard, N. (2014). Social differentiation in young people's political participation: The impact of social and educational factors on youth political engagement in Britain. *Journal of Youth Studies, 17*(3), 360-380. doi: 10.1080/13676261.2013.830704

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

Hobson, K. (2013). On the making of the environmental citizen. *Environmental Politics, 22*(1), 56-72. doi: 10.1080/09644016.2013.755388

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

Hox, J.J., Moerbeek, M., & van de Schoot, R. (2017). *Multilevel Analysis: Techniques and Applications* (third edition). New York: Routledge.

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

Ideland, M. (2016). The Action-Competent child: Responsibilization through practices and emotions in environmental education. *Knowledge Cultures 4*(2), 95–112.

Isac, M.M., Sass, W., Boeve-de Pauw, J., De Maeyer, S., Schelfhout, W., Van Petegem, P., Claes, E. (2022). Differences in Teachers' Professional Action Competence in Education for Sustainable Development. The importance of teacher co-learning. *Sustainability*, *14*, 767. doi: 10.3390/su14020767

Janssen-Noordman, A.M.B., Merriënboer, J.J.G., van der Vleuten, C.P.M., & Scherpbier, A.J.J.A. (2006). Design of integrated practice for learning professional competences. *Medical Teacher, 28*(5), 447-452. doi: 10.1080/01421590600825276

Javadinejad, S., Dara, R., Jafary, F. (2020). Climate Change Scenarios and Effects on Snow-Melt Runoff. *Civil Engineering Journal, 6*(9), 1715-1725. doi: 10.28991/cej-2020-03091577

Jensen, B.B. (1997). A case of two paradigms within health education. *Health Education Research, 12*(4), 419-428.

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., (Eds.) (1993): *Handlekompetence som didaktisk begreb*. Didaktiske studier. Bidrag til didaktikkens teori og historie,bd 2. København: Danmarks Lærerhøjskole.

Jensen, B.B., & Schnack, K. (1997/2006). 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. doi:10.1080/00220270701684667

Juris, J.S., & Pleyers, G.H. (2009). Alter-activism: emerging cultures of participation among young global justice activists. *Journal of Youth Studies, 12*(1), 57-75. doi: 10.1080/13676260802345765

Ke , L., Sadler, T. D., Zangori, L., & Friedrichsen, P. J. (2020). Students' perceptions of socio-scientific issue-based learning and their appropriation of epistemic tools for systems thinking, *International Journal of Science Education, 42*(8), 1339-1361. doi: 10.1080/09500693.2020.1759843

Kelly, A., & Clarke, P. (2016). The challenges of globalisation and the new policy paradigms for educational effectiveness and improvement research. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie, (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 365–379). London and New York: Routledge.

Kerich, E.C. (2020). Households Drinking Water Sources and Treatment Methods Options in a Regional Irrigation Scheme. *Journal of Human, Earth, and Future, 1*(1), 10-19. doi: 10.28991/HEF-2020-01-01-02

Knippels, M. C. P. J., & van Harskamp, M. (2018). An educational sequence for implementing socio-scientific inquiry-based learning. *School Science Review, 100*(371), 46–52.

Krnel, D., & Naglič, S. (2009). Environmental literacy comparison between eco-schools and ordinary schools in Slovenia. *Science Education International, 20*(1-2), 5-24.

Kumler, L. M. (2010). Students of action?: A comparative investigation of secondary science and social studies students' action repertoires in a land use context. *Journal of Environmental Education 42*(1), 14–29. doi: 10.1080/00958960903479829

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). *R Package lmerTest* (Version 3.1-2) [computer software]. RStudio.

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

Laurie, R., Nonoyama-Tarumi, Y., Mckeown, R., Hopkins, C. (2016). Contributions of Education for Sustainable Development (ESD) to Quality Education: A Synthesis of Research. *Journal of Education for Sustainable Development, 10*(2), 226-242. doi: 10.1177/0973408216661442

Lee, Y. C., Grace, M., Rietdijk, W., & Lui, Y. C. (2019). A cross-cultural, cross-age, and cross-gender study of Hong Kong and UK secondary students' decision making about a biological conservation issue. *International Journal of Science Education, 41*(18), 2696-2715. doi: 10.1080/09500693.2019.1693662

Levy, B.L.M., & Zint, M.T. (2013). Toward fostering environmental political participation: framing an agenda for environmental education research. *Environmental Education Research, 19*(5), 553-576. doi: 10.1080/13504622.2012.717218

Liobikiene, G., & Simas Poskus, M. (2019). The importance of environmental knowledge for private and public sphere pro-environmental behavior: Modifying the value-belief-norm theory. *Sustainability, 11,* 3324. doi: 10.3390/su11123324

Manni, A., & Knekta, E. (2020). "A Little Less Conversation, a Little More Action Please": Examining Students' Voices on Education, Transgression, and Societal Change. *Sustainability*, *12*(15), 6231. doi: 10.3390/su12156231

Melo-Escrihuela, C. (2008). Promoting ecological citizenship: rights, duties and political agency. *ACME: An International Journal for Critical Geographies 7*(2), 113-34.

Menzie-Ballantyne, K., & Ham, M. (2021). School Strike 4 Climate: The intersection of education for sustainable development, education for global citizenship and the Australian Curriculum. *Australian Journal of Environmental Education*, 1-11. doi: 10.1017/aee.2021.14

Milfont, T. L. (2012). The interplay between knowledge, perceived efficacy, and concern about global warming and climate change: a one-year longitudinal study. *Risk Analysis: An International Journal, 32*(6), 1003-1020. doi: 10.1111/j.1539-6924.2012.01800.x

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. doi:10.20533/ijds.2040.2570.2010.0010

Minelgaitė, A., & Liobikienė, G. (2021). Changes in pro-environmental behaviour and its determinants during long-term period in a transition country as Lithuania. *Environment, Development and Sustainability,* 1-17. doi: 10.1007/s10668-021-01329-9

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

Moeller, J., Keiner, M., & Grassinger, R. (2015). Two sides of the same coin: Do the dual 'types' of passion describe distinct subgroups of individuals? *Journal for Person-oriented Research, 1*(3), 131-150. doi: 10.17505/jpor.2015.15

Mogensen, F. (1997). Critical thinking: a central element in developing action competence in health and environmental education. *Health Education Research, 12*(4), 429-436. doi: 10.1093/her/12.4.429

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

Moustakas, C. (1994). *Phenomenological research methods.* Thousand Oaks, CA: Sage.

Muijs, D. (2006). Measuring teacher effectiveness: Some methodological reflections. *Educational Research and Evaluation, 12*(1), 53-74. doi: 10.1080/13803610500392236

Muijs, D., Kyriakides, L., van der Werf, G., Creemers, B., Timperley, H., & Earl, L. (2014). State of the art – teacher effectiveness and professional learning. *School Effectiveness and School Improvement, 25*(2), 231-256. doi: 10.1080/09243453.2014.885451

Muijs, D., Reynolds, D., & Kyriakides, L. (2016). The scientific properties of teacher effects/effective teaching processes. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie, (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 100–123). London and New York: Routledge.

Murphy, C., Mallon, B., Smith, G., Kelly, O., Pitsea, V., & Sainz, G.M. (2021). The influence of a teachers' professional development programme on primary school pupils understanding of and attitudes towards sustainability. *Environmental Education Research, 27*(7), 1011-1036. doi: 10.1080/13504622.2021.1889470

Murphy, C., Smith, G., Mallon, B., & Redman, E. (2020). Teaching about sustainability through inquiry-based science in Irish primary classrooms: The impact of a professional development programme on teacher self-efficacy, competence and pedagogy. *Environmental Education Research, 26*(8), 1112-1136. doi: 10.1080/13504622.2020.1776843

Newton, M. H., & Zeidler, D. L. (2020). Developing socioscientific perspective taking. *International Journal of Science Education, 42*(8), 1302-1319. doi: 10.1080/09500693.2020.1756515

Ojala, M. (2012). Regulating worry, promoting hope: How do children, adolescents, and young adults cope with climate change? *International Journal of Environmental and Science Education, 7*(4), 537–561.

Ojala, M. (2016). Facing anxiety in climate change education: from therapeutic practice to hopeful transgressive learning. *Canadian Journal of Environmental Education, 21*, 41-56.

Olsson, D. (2018). *Student sustainability consciousness – Investigating effects of education for sustainable development in Sweden and beyond.* (Doctoral dissertation). Karlstad: Karlstad University Studies. Retrieved from http://www.diva-portal.se/smash/get/diva2:1257928/FULLTEXT02.pdf

Olsson, D., Gericke, N., & Boeve-de Pauw, J. (2022). The effectiveness of education for sustainable development revisited - a longitudinal study on secondary students' action competence for sustainability. *Environmental Education Research*. doi: 10.1080/13504622.2022.2033170

Olsson, D., Gericke, N., Boeve-de Pauw, J., Berglund, T., & Chang, T. (2019). Green schools in Taiwan–Effects on student sustainability consciousness. *Global Environmental Change, 54*, 184-194. doi: 10.1016/j.gloenvcha.2018.11.011

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

Oo, H., Zin, W., & Kyi, C. (2020). Analysis of Streamflow Response to Changing Climate Conditions Using SWAT Model. *Civil Engineering Journal. 6*(2), 194-209. doi: 10.28991/cej-2020-03091464

Ostrom, E. (2014). A Polycentric Approach For Coping With Climate Change. *Annals of Economics and Finance, 15*(1), 97-134. doi: 10.1596/1813-9450-5095

Ottander, K., & Simon, S. (2021). Learning democratic participation? Meaning-making in discussion of socioscientific issues in science education. *International Journal of Science Education, 43*(12), 1895-1925. doi: 10.1080/09500693.2021.1946200

Oulton, C., Dillon, J., & Grace, M. M. (2004). Reconceptualizing the teaching of controversial issues. *International Journal of Science Education, 26*(4), 411-423. doi: 10.1080/0950069032000072746

Öhman, J. (2008). Environmental ethics and democratic responsibility – A pluralistic approach to ESD. In J. Öhman (Ed.), *Values and democracy in education for sustainable development: Contributions from Swedish research* (pp. 17–32). Malmö: Liber.

Öhman, J., & Sund, L. (2021). A Didactic Model of Sustainability Commitment. *Sustainability (13)*6, 3083. doi: 10.3390/su13063083

Pelletier, L.G., Dion, S., Tuson, K., & Green-Demers, D. (1999). Why do people fail to adopt environmental protective behaviors? Toward a taxonomy of environmental amotivation. *Journal of Applied Social Psychology, 29*(12), 2481-2504. doi: 10.1111/j.1559-1816.1999.tb00122.x

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. doi:10.1111/j.1559-1816.1998.tb01714.x

Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., & R Core Team. (2014). *R Package nlme* (version 3.1-150) [computer software]. RStudio.

Rabe-Hesketh, S., & Skrondal, A. (2012). *Multilevel and Longitudinal Modeling using Stata* (Third edition). Texas: STATA Press.

Redman, E., Murphy, C. Mancilla, Y., Mallon, B., Kater-Wettsaedt, L., Barth, M., Ortiz, M.G., Smith, G., & Kelly, O. (2021). International scaling of sustainability continuing professional development for in-service teachers. *Interdisciplinary Journal of Environmental and Science Education, 17*(3), e2243. doi: 10.21601/ijese/10936

Redman, E., Wiek, A., & Redman, A. (2018). Continuing professional development in sustainability education for K-12 teachers: Principles, programme, application, outlook. *Journal of Education for Sustainable Development, 12*(1), 59-80. doi: 10.1177/2455133318777182

Revelle, W. (2021) psych: Procedures for Personality and Psychological Research, Northwestern University, Evanston, Illinois, USA, https://CRAN.R-project.org/package=psych Version = 2.1.6.

Reynolds, D., Chapman, C., Clarke, P., Muijs, D., Sammons, P., & Teddlie, C. (2016). The future of educational effectiveness and improvement research, and some suggestions and speculations. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 408-439). London and New York: Routledge.

Reynolds, D., Sammons, P., De Fraine, B., Van Damme, J., Townsend, T., Teddlie, C., & Stringfield, S. (2014). Educational effectiveness research (EER): a state-of-the-art review. *School Effectiveness and School Improvement, 25*(2), 197-230. doi: 10.1080/09243453.2014.885450

Reynolds, D., Teddlie, C., Chapman, C., & Stringfield, S. (2016). Effective school processes. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 77-99). London and New York: Routledge.

Romine, W.L., Sadler, T.D., Dauer, J.M., & Kinslow, A. (2020). Measurement of socio-scientific reasoning (SSR) and exploration of SSR as a progression of competencies. *International Journal of Science Education, 42*(18), 2981-3002. doi: 10.1080/09500693.2020.1849853

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software, 48*(2), 1–36. doi: 10.18637/jss.v048.i02

Rudsberg, K., & Öhman, J. (2010). Pluralism in practice – experiences from Swedish evaluation, school development and research. *Environmental Education Research, 16*(1), 95-111. doi: 10.1080/13504620903504073

Ryan, R.M., & Deci, E.L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67. doi: 10.1006/ceps.1999.1020

Sadler, T. D., Romine, W. L., & Topçu, M. S. (2016). Learning science content through socio-scientific issues-based instruction: a multi-level assessment study. *International Journal of Science Education, 38*(10), 1622-1635. doi: 10.1080/09500693.2016.1204481

Sammons, P., Davis, S., & Gray, J. (2016). Methodological and scientific properties of school effectiveness research. Exploring the underpinnings, evolution, and future directions of the field. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 25-76). London and New York: Routledge.

Sass, W., Boeve-de Pauw, J., De Maeyer, S., & Van Petegem, P. (2021): 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). *Environmental Education Research, 27*(9), 1284-1304. doi: 10.1080/13504622.2021.1888887

Sass, W., Boeve-de Pauw, J., Olsson, D., Gericke, N., De Maeyer, S., & Van Petegem, P. (2020). Redefining action competence: The case of sustainable development. *The Journal of Environmental Education. (51)*4, 292-305. doi: 10.1080/00958964.2020.1765132

Sass, W., Claes, E., Boeve-de Pauw, J. De Maeyer, S., Schelfhout, W., Van Petegem, P., Isac, M.M. (2022). Measuring Professional Action Competence in Education for Sustainable Development (PACesd). *Environmental Education Research*, *28*(2), 260–275. doi:10.1080/13504622.2021.1976731

Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (2022). Honing Action Competence in Sustainable Development: What happens in classrooms matters. *Environment, Development and Sustainability*. doi: 10.1007/s10668-022-02195-9

Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (submitted). Effectiveness of Education for Sustainable Development Practices Regarding Students' Action Competence in Sustainable Development: The importance of an action-oriented approach. *Research in Science & Technological Education.*

Sass, W., Quintelier, A., Boeve-de Pauw, J., De Maeyer,S., Gericke, N., & Van Petegem, P. (2021): Actions for sustainable development through young students' eyes. *Environmental Education Research, 27*(2), 234-253. doi: 10.1080/13504622.2020.1842331

Scheerens, J. (2016). *Educational Effectiveness and Ineffectiveness. A Critical Review of the Knowledge Base.* Dordrecht: Springer.

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

Sekhar, C., & Raina, R. (2021). Towards more sustainable future: assessment of sustainability literacy among the future managers in India. *Environment, Development and Sustainability,* 1-27. doi: 10.1007/s10668-021-01316-0

Shay-Margalit, B., & Ofir, D. R. (2017). Effect of the Israeli "Green Schools" Reform on Pupils' Environmental Attitudes and Behavior. *Society & Natural Resources. 30*(1), 112-128. doi: 10.1080/08941920.2016.1171939

Shephard, K., Rieckmann, M., & Barth, M. (2019). Seeking sustainability competence and capability in the ESD and HESD literature: an international philosophical hermeneutic analysis. Environmental Education Research, 25(4), 532-547. doi: 10.1080/13504622.2018.1490947

Sinakou, E., Donche, V., Boeve-de Pauw, J., & Van Petegem, P. (2019). Designing Powerful Learning Environments in Education for Sustainable Development: A Conceptual Framework. *Sustainability, 11*(21), 5994. doi: 10.3390/su11215994

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* (pp. 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.

Soler-i-Martí, R. (2015). Youth political involvement update: measuring the role of cause-oriented political interest in young people's activism. *Journal of Youth Studies, 18*(3), 396-416. doi: 10.1080/13676261.2014.963538

Stables, A., & Scott, W. (2002). The Quest for Holism in Education for Sustainable Development. *Environmental Education Research, 8*(1), 53-60. doi: 10.1080/13504620120109655

Stern, P.C. (2000). Toward a coherent theory of environmentally significant behaviour. *Journal of Social Issues, 56*(3), 407–424. doi: 10.1111/0022-4537.00175

Strandbu, Å., & Skogen, K. (2000). Environmentalism among Norwegian Youth: Different Paths to Attitudes and Action? *Journal of Youth Studies, 3*(2), 189-209. doi: 10.1080/713684371

Sund, P. J., & Gericke, N. (2021). More Than Two Decades of Research on Selective Traditions in Environmental and Sustainability Education—Seven Functions of the Concept. *Sustainability*, *13*(12), 6524. doi: 10.3390/su13126524

Taylor, N., Quinn, F., Jenkins, K., Miller-Brown, H., Rizk, N., Prodromou, T., Serow, P., & Taylor, S. (2019). Education for Sustainability in the Secondary Sector—A Review. *Journal of Education for Sustainable Development, 13*(1), 102–122. doi:10.1177/0973408219846675

Teddlie, C., & Tashakkori, A. (2009). *Foundations of Mixed Methods Research: Integrating Quantitative and Qualitative Approaches in the Social and Behavioral Sciences*. London: Sage.

The Guardian (24 May 2019). *Latest global school climate strikes expected to beat turnout record*. Retrieved on Nov. 19, 2019 from https://www.theguardian.com/environment/2019/may/24/latest-global-school-climate-strikes-expected-to-beat-turnout-record

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

Townsend, T., MacBeath, J., & Bogotch, I. (2016). Critical and alternative perspectives on educational effectiveness and improvement research. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie (Eds.), *The Routledge International Handbook of Educational Effectiveness and Improvement* (pp. 380-407). London and New York: Routledge.

UNESCO (1977). Intergovernmental Conference on Environmental Education. 1977. *The Tbilisi Declaration.* Retrieved from http://gdrc.org/uem/ee/EE-Tbilisi_1977.pdf

UNESCO (2017). *Education for Sustainable Development Goals: Learning Objectives.* UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000247444

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

United Nations. (2019). *Report of the Secretary-General on the 2019 Climate Action Summit and the Way Forward in 2020.* Retrieved from https://www.un.org/sites/un2.un.org/files/cas_report_11_dec_0.pdf

United Nations. (2022) Advance unedited version of *Decision -/CP.26 Glasgow Climate Pact*. Retrieved from https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf

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

Vallerand, R.J., Mageau, G.A., Ratelle, C., Léonard, M., Blanchard, C., Koestner, R., & Gagné, M. (2003). Les passions de l'âme: On obsessive and harmonious passion. *Journal of Personality and Social Psychology, 85*(4), 756–767. doi : 10.1037/0022-3514.85.4.756

Vansteenkiste, M., Lens, W., & Deci, E.L. (2006). Intrinsic versus extrinsic goal contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist, 41*(1), 19-31. doi: 10.1207/s15326985ep4101_4

Varela-Losada, M., Vega-Marcote, P., Pérez-Rodríguez, U., & Álvarez-Lires, M. (2016). Going to action? A literature review on educational proposals in formal Environmental Education. *Environmental Education Research, 22*(3), 390-421. doi: 10.1080/13504622.2015.1101751

Verhelst, D. (2022). *Sustainable Schools for Sustainable Education: characteristics of an ESD-effective school.* (Doctoral Dissertation).

Wickham, H.. (2016). *R Package ggplot2* (version 3.3.2) [computer software]. RStudio.

Wiek, A., Withycombe, L., & Redman, C.L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science, 6*, 203-218. doi: 10.1007/s11625-011-0132-6

Wiek, A., Withycombe, L., Redman, C., Mills, S, B. (2011b). Moving forward on competence in sustainability research and problem solving. *Environment, 53*(2), 3-13.

Wiek, A., Bernstein, M., Foley, R., Cohen, M., Forrest, N., Kuzdas, C., Kay, B., & Withycombe Keeler, L. (2015). Operationalising competencies in higher education for sustainable development. In M. Barth, G. Michelsen, M. Rieckmann, & I. Thomas (Eds.), *Handbook of Higher Education for Sustainable Development* (pp. 241-260). Routledge, London.

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. doi:10.1016/S0191-8869(02)00071-5

World Economic Forum (2020). *Meet the teenage change-makers making waves at Davos 2020.* Retrieved on Feb. 03, 2020 from https://www.weforum.org/agenda/2020/01/the-teenage-change-makers-at-davos-2020?fbclid=IwAR16rtfqxMVg0qmMRPg7mZa9ECh9fdp7jp2cBmEYJ_ut9lNT_jQgqBQZWbk

World Environmental Education Congress (WEEC; 2022, March 13-17). Youth Environmental Education Congress, Prague. https://weec2022.org/programme/youth-congress/

Wu, H., & Mweemba, L. (2010). Environmental self-efficacy, attitude and behavior among small scale farmers in Zambia. Environment. *Development and Sustainability, 12*(5), 727-744. doi: 10.1007/s10668-009-9221-4

Yilmaz, V., & Can, Y. (2020). Impact of knowledge, concern and awareness about global warming and global climatic change on environmental behavior. *Environment, Development and Sustainability, 22*(7), 6245-6260. doi: 10.1007/s10668-019-00475-5

Youth Constituency of the United Nations Framework Convention on Climate Change (2021). *The Global Youth Statement.* Glasgow: YOUNGO.

Short biography and publications by the author

Short biography

Wanda Sass started a career as a qualified translator and language teacher (Dutch, English, Portuguese), after obtaining a bachelor teacher degree for secondary education (Dutch, English, and history) in 1985 and a Master's degree in Translation (Dutch, English, Portuguese, and Danish) in 1989. A postgraduate degree in remedial teaching followed in 2002. In 2016, she obtained a Master in Education and Training Sciences at the University of Antwerp, where she started working on a PhD on action competence in 2017, after having taught languages and citizenship education in secondary education for 28 years. She was a freelance teacher trainer in the postgraduate training remedial teaching in secondary education at CNO, the University of Antwerp's Centre for in-service teacher professional development (2008-2012). Her research interests include motivation towards the environment, environmental education, nature connectedness, education for sustainable development, action competence (in sustainable development), and teacher professional development regarding ESD.

Publications on which this dissertation is based

Chapter 2

Sass, W., Boeve-de Pauw, J., Olsson, D., Gericke, N., De Maeyer, S., & Van Petegem, P. (2020). Redefining action competence: The case of sustainable development. *The Journal of Environmental Education. (51)*4, 292-305. doi: 10.1080/00958964.2020.1765132

Chapter 3

Sass, W., Quintelier, A., Boeve-de Pauw, J., De Maeyer,S., Gericke, N., & Van Petegem, P. (2021): Actions for sustainable development through young students' eyes. *Environmental Education Research, 27*(2), 234-253. doi: 10.1080/13504622.2020.1842331

Chapter 4

Sass, W., Boeve-de Pauw, J., De Maeyer, S., & Van Petegem, P. (2021): 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). *Environmental Education Research, 27*(9), 1284-1304. doi: 10.1080/13504622.2021.1888887

Chapter 5

Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (2022). Honing Action Competence in Sustainable Development: What happens in classrooms matters. *Environment, Development and Sustainability*. doi: 10.1007/s10668-022-02195-9

Chapter 6

Sass, W., De Maeyer, S., Boeve-de Pauw, J., & Van Petegem, P. (submitted). Effectiveness of Education for Sustainable Development Practices Regarding Students' Action Competence in Sustainable Development: The importance of an action-oriented approach. *Research in Science & Technological Education.*

Other publications by the same author

Heyman, S.; Jansen, T.; Sass, W.; Boeve- de Pauw, J.; Keune, H.; Michels, N; Van Petegem, P.(2021). Natuurbetrokkenheid bij Jongeren in het Secundair Onderwijs: literatuurstudie en casestudie. Wetenschappelijk rapport. Antwerpen: Universiteit Antwerpen

Isac, M.M., Sass, W., Boeve-de Pauw, J., De Maeyer, S., Schelfhout, W., Van Petegem, P., Claes, E. (2022). Differences in Teachers' Professional Action Competence in Education for Sustainable Development. The importance of teacher co-learning. *Sustainability*, *14*, 767. doi: 10.3390/su14020767

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

Sass, W., Boeve-de Pauw, J., Donche, V., & Van Petegem, P. (2018). "Why (should) I do something for the environment?" Profiles of Flemish adolescents' motivation towards the environment. *Sustainability, 10*(7), 2579. doi: 10.3390/su10072579

Sass, W., Claes, E., Boeve-de Pauw, J. De Maeyer, S., Schelfhout, W., Van Petegem, P., Isac, M.M. (2022). Measuring Professional Action Competence in Education for Sustainable Development (PACesd). *Environmental Education Research*, *28*(2), 260–275. doi:10.1080/13504622.2021.1976731

Appendices

Appendix 1. Table A1 and supplemental materials with study 2

Table A1. General definitions of action categories and issues the actions were targeted at as used during analyses (based on Breiting & Mogensen, 1999; Clark, 2016; ENEC, 2018; Jensen, 2000; Jensen & Schnack, 2006; Levy & Zint, 2013; Liobikiene & Simas Poskus, 2019; Melo-Escrihuela, 2008; Mogensen & Schnack, 2010; Stern, 2000; UN, 2015).

Action categories	**Definition used during analyses**
Individual	The intention of others that contribute to the action may define the individual or collective feature: if people participate in a financial or commercial transaction with no intention other than to sell or buy, then the funds raising to donate to a charity = individual
Collective	collective action = an action that the agent seeks to do as part of a group effort Collective action competence is defined as "the capability of a group of people to direct their behaviour toward a common goal based on a collective literacy, a collective competence (set of skills and experiences) and a collective need or goal. This definition encompasses the resulting solution-directed collective action." (Clark, 2016, p. 560) intention= key to distinguishing between individual or collective
Direct	Direct action = an action that is directly aimed at solving an issue (= controversial problem)
Indirect	indirect action = action that is aimed at making others contribute to solving a controversial problem (= issue)
Private	actions in the private sphere (e.g. recycling, limiting car use and green consumption, for instance buying organic products) (Liobikiene & Simas Poskus, 2019)
Public	actions in the public sphere (at a societal level; behaviour as citizens)
Issues that actions targeted	
planet	We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.

prosperity	We are determined to ensure that all human beings can enjoy prosperous and fulfilling lives and that economic, social and technological progress occurs in harmony with nature.
people	We are determined to end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment.
partnership	We are determined to mobilize the means required to implement this Agenda through a revitalized Global Partnership for Sustainable Development, based on a spirit of strengthened global solidarity, focused in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all people.
peace	We are determined to foster peaceful, just and inclusive societies which are free from fear and violence. There can be no sustainable development without peace and no peace without sustainable development.

Statements 'pluralism' game (English)

1. *I love Brussels sprouts.*
2. *I'm good at singing.*
3. *I love snow.*
4. *I love summer.*
5. *I think friendship is important.*
6. *I have a Facebook account.*
7. *I think it's important to have many friends on.*
8. *I know all my Facebook friends in the real world too.*
9. *I love watching films.*
10. *I like going to the cinema.*
11. *I think it's important to have a smartphone.*
12. *As soon as there's a new smartphone in the shops, I want to have it.*
13. *I prefer playing outdoors to playing indoors.*
14. *I feel good when I'm in the woods.*
15. *I like being at the seaside.*
16. *I think people are more important than animals.*
17. *I think it's important that clothes are made by adults and not by children.*
18. *It's normal that not everyone has the same amount of money.*
19. *I think it's bad that …*
20. *I like …*
21. *I think… [situation in the world/school/local community] should change.*

<u>En route to a better world! (English)</u>

A sustainable world is a world in which we all have a good life, now and later, without damaging the planet.

→ 17 goals for a better world (United Nations)

The 17 goals are connected to each other. If we want to progress toward one goal, we also have to take into account the other goals.

Now that you know about the 17 goals, you can match them to the fitting icon.

1. no poverty
2. no hunger
3. a healthy life for everyone
4. good education
5. equality between boys and girls
6. water and sanitary facilities for everyone
7. modern and sustainable energy
8. decent work for everyone
9. technology for everyone
10. less inequality
11. safe cities and towns
12. responsible consumption
13. reduce climate change
14. protect seas and oceans
15. take care of the earth
16. peace everywhere and for everyone
17. cooperate in order to achieve the goals

Worksheets (English)

<u>En route to a better world!</u>

With 'my world' I mean:

_____

I think that in my world quite some good things are being done for these 3 goals:

1. _____

2. _____

3. _____

I think that in my world most work remains to be done for these 3 goals:

1. _____

2. _____

3. _____

This is the most important goal I want to contribute to:

_____

because:

_____

If we all succeed in achieving the goal I want to contribute to, my world would look like this:

_____

_____

This is how I can contribute to this goal myself:

Describe, draw a mindmap, a chart, or make a drawing about what you can do:

I have worked on my own. I have worked in a group with[4]:

_____

_____

_____

_____

En route to a better world!

With 'our world' we mean:

_____

This is the most important goal we want to contribute to:

_____

because:

_____

If we all succeed in achieving the goal our group wants to contribute to, our world would look like this:

_____

_____

This is how we can contribute to this goal with our group:

_____

[4] Delete what is NOT applicable.

Describe, draw a mindmap, a chart, or make a drawing about what you can do:

Put here how you are going to further develop this. How are you going to present your ideas to your classmates? Who is going to do what by when?

This is how we are going to work on our presentation:

Who	What	Finished by

Appendix 2. Extra materialen bij studie 2 (Dutch)

Stellingen "pluralisme"-spel

1. *Ik hou van spruitjes.*
2. *Ik kan goed zingen.*
3. *Ik vind het leuk als er sneeuw ligt.*
4. *Ik hou van de zomer.*
5. *Ik vind vriendschap belangrijk.*
6. *Ik heb een Facebook account.*
7. *Ik vind het belangrijk om veel vrienden te hebben op Facebook.*
8. *Ik ken al mijn Facebookvrienden ook in 't echt.*
9. *Ik hou van film.*
10. *Ik ga graag naar de bioscoop.*
11. *Ik vind het belangrijk om een smartphone te hebben.*
12. *Zodra er een nieuwe smartphone in de winkel ligt, wil ik die graag hebben.*
13. *Ik speel liever buiten dan binnen.*
14. *Ik voel me goed in het bos.*
15. *Ik ben graag aan zee.*
16. *Ik vind dat mensen belangrijker zijn dan dieren.*
17. *Ik vind het belangrijk dat kleren gemaakt worden door volwassenen en niet door kinderen.*
18. *Het is normaal dat niet iedereen even veel geld heeft.*
19. *Ik vind het erg dat…*
20. *Ik hou ervan dat…*
21. *Ik vind dat … [situatie in de wereld/de school/de buurt] moet veranderen*.

Op weg naar een betere wereld!

Een duurzame wereld is een wereld waarin we allemaal een goed leven hebben nu en later, zonder dat onze planeet eronder lijdt.

→ 17 doelen voor een betere wereld (Verenigde Naties)

De 17 doelen zijn met elkaar verbonden. Willen we vooruitgang maken op één doel, dan moeten we ook rekening houden met de andere doelen.

Nu je de 17 doelen kent, kan je ze verbinden met het bijbehorende icoontje.

1. geen armoede
2. geen honger
3. een gezond leven voor iedereen
4. goed onderwijs
5. gelijkheid tussen jongens en meisjes
6. water en sanitaire voorzieningen voor iedereen
7. moderne en duurzame energie
8. waardig werk voor iedereen
9. technologie voor iedereen
10. minder ongelijkheid
11. veilige steden en dorpen
12. verantwoorde consumptie
13. klimaatverandering tegengaan
14. zeeën en oceanen beschermen
15. zorg dragen voor de aarde
16. vrede overal en voor iedereen
17. samenwerken om de doelen te bereiken

Werkbladen (Dutch)

Op weg naar een betere wereld!

Met 'mijn wereld' bedoel ik:

_____

Ik vind dat in mijn wereld al heel wat goede dingen gebeuren voor deze 3 doelen:

1. _____

2. _____

3. _____

Ik vind dat in mijn wereld nog het meeste werk is aan deze 3 doelen:

1. _____

2. _____

3. _____

Dit is het belangrijkste doel waaraan ik zelf wil meewerken:

_____

omdat: _____

Als we er met zijn allen in slagen om het doel te bereiken waaraan ik wil werken dan zou mijn wereld er zo uitzien:

_____

_____

_____

_____

_____

Ik kan zelf op deze manier iets doen om mee te werken aan dit doel:

Beschrijf, maak een mindmap, een schema of teken hier wat jij kan doen.

Ik heb alleen gewerkt. Ik heb in groep gewerkt met[5]:

_____

_____

_____

_____

<u>Samen op weg naar een betere wereld!</u>

Met 'onze wereld' bedoelen wij:

_____

Dit is het belangrijkste doel waaraan wij zelf willen meewerken:

_____

omdat: _____

Als we er met zijn allen in slagen om het doel te bereiken waaraan onze groep wil werken dan zou onze wereld er zo uitzien:

_____

_____

_____

_____

[5] Schrappen wat NIET van toepassing is.

Wij kunnen zelf op deze manier iets doen om mee te werken aan dit doel:

Beschrijf, maak een mindmap, een schema of teken hier wat jullie kunnen doen.

Vertel hier hoe jullie dit verder gaan uitwerken om je ideeën te presenteren aan je klasgenoten. Wie gaat wat doen tegen wanneer?

Wij gaan onze **presentatie** verder uitwerken op deze manier:

Wie	**Wat**	**Afgewerkt tegen**

Appendix 3. Tables A2 and A3 in study 3

Table A2. 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			
Organising 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 organisations		X			X
Raising/collecting, and donating funds, equipment (e.g. boats), food, or clothes to the needy		X	(X)	X	
Asking authorities and nations for help or support					X
Raising and donating funds, food, or clothes to aid organisations		X			(X)
Creating opportunities for education, earning a life, and housing		X	X		
Organising a school event to inform/educate the public about how eco-friendly behaviour 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, neighbours,…)		X			(X)
Putting a message for peace on social media				X	
Calling for a boycott of products tested on animals	X				
Promoting eco-friendly behaviour (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 organisations		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 A3. Descriptives and reliability of the action competence in sustainable development questionnaire and subscales (ACiSD-Q; study 3; English translations by first author)

ACiSD subscale *n* = 1796		**Cronbach's α** (0.92 for ACiSD)	**item**	**means**	**SD**
Knowledge *People contribute to a good life for everyone without damaging the planet if they…*		α = 0.74		4.1	0.56
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
Knowledge People	… give clothes they don't use any more to people that live in poverty here with us.	K6	4.4	0.88
	… organise a jumble sale and donate the profit to a charity.	K8	4.1	1.01
	… treat boys and girls as equal.	K11	4.5	0.81
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 *I want to…*	$\alpha = 0.77$		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 I don't use any more to people that live in poverty here with us.	W6	4.2	1.02
	… organise a jumble sale 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 I don't use any more to people who have fled from war.	W7	4.0	1.10
Capacity Expectations *I can…*	$\alpha = 0.73$		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 I don't use any more to people that live in poverty here with us.	CE6	4.1	1.08
	… organise a jumble sale 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 I don't use any more to people who have fled from war.	CE7	3.8	1.19
Outcome Expectancy *I contribute to a good life for everyone without damaging the planet if I…*		$\alpha = 0.79$	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 I don't use any more to people that live in poverty here with us.	OE6	4.1	1.06
	… organise a jumble sale 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 I don't use any more to people who have fled from war.	OE7	3.9	1.15
Self-efficacy	α = .86		3.9	0.59

Appendix 4. Table A4: The ACiSD-Q as used in studies 4 and 5

Table A4. The ACiSD-Q and subconstructs (English translations by first author)

ACiSD subconstruct		**item**
Conceptual Knowledge *People contribute to a good life for everyone without damaging the planet if they…*		
Knowledge Planet	… save electricity and water at home	K4
	… collect litter from the streets with friends.	K9
	… only use toiletries from brands that don't experiment on animals.	K10
Knowledge People	… give clothes they don't use any more to people that live in poverty here with us.	K6
	… organise a jumble sale and donate the profit to a charity.	K8
	… treat boys and girls as equal.	K11
Knowledge Peace	… use social media (such as YouTube) to convey a message for peace.	K1
	… develop an action against bullying at school.	K2
	… give clothes they don't use any more to people who have fled from war.	K7
Willingness *I want to…*		
Willingness Planet	… save electricity and water at home	W4
	… collect litter from the streets with friends.	W9
	… only use toiletries from brands that don't experiment on animals.	W10
Willingness People	… give clothes I don't use any more to people that live in poverty here with us.	W6
	… organise a jumble sale and donate the profit to a charity.	W8
	… treat boys and girls as equal.	W11
Willingness Peace	… use social media (such as YouTube) to convey a message for peace.	W1
	… develop an action against bullying at school.	W2
	… give clothes I don't use any more to people who have fled from war.	W7
Capacity Expectations (Self-efficacy) *I can…*		
Capacity Expectations Planet	… save electricity and water at home	CE4
	… collect litter from the streets with friends.	CE9

	… only use toiletries from brands that don't experiment on animals.	CE10
Capacity Expectations People	… give clothes I don't use any more to people that live in poverty here with us.	CE6
	… organise a jumble sale and donate the profit to a charity.	CE8
	… treat boys and girls as equal.	CE11
Capacity Expectations Peace	… use social media (such as YouTube) to convey a message for peace.	CE1
	… develop an action against bullying at school.	CE2
	… give clothes I don't use any more to people who have fled from war.	CE7
Outcome Expectancy (Self-efficacy) *I contribute to a good life for everyone without damaging the planet if I…*		
Outcome Expectancy Planet	… save electricity and water at home	OE4
	… collect litter from the streets with friends.	OE9
	… only use toiletries from brands that don't experiment on animals.	OE10
Outcome Expectancy People	… give clothes I don't use any more to people that live in poverty here with us.	OE6
	… organise a jumble sale and donate the profit to a charity.	OE8
	… treat boys and girls as equal.	OE11
Outcome Expectancy Peace	… use social media (such as YouTube) to convey a message for peace.	OE1
	… develop an action against bullying at school.	OE2
	… give clothes I don't use any more to people who have fled from war.	OE7

Appendix 4. Table A5: De ACiSD-Q (Nederlands; studies 3, 4 en 5)

Table A5. De ACiSD-Q en subconstructen (Nederlands)

ACiSD subconstruct		**item**
Conceptuele Kennis *Mensen zorgen voor een goed leven voor iedereen zonder dat het slecht is voor de planeet, als ze…*		
Conceptuele Kennis "Planet"	…thuis spaarzaam omgaan met elektriciteit en water.	K4
	…samen met vrienden vuilnis oprapen op straat.	K9
	…enkel verzorgingsproducten gebruiken van merken die geen proeven doen op dieren.	K10
Conceptuele Kennis "People"	…kleren die ze niet meer dragen, geven aan mensen die in armoede leven hier bij ons.	K6
	…een rommelmarkt organiseren en de winst schenken aan een goed doel..	K8
	…jongens en meisjes gelijk behandelen.	K11
Conceptuele Kennis "Peace"	… sociale media gebruiken zoals bijvoorbeeld YouTube om een boodschap voor vrede te verspreiden.	K1
	…op school een project tegen pesten uitwerken.	K2
	…kleren die ze niet meer dragen, geven aan mensen die gevlucht zijn voor oorlog.	K7
Willingness: Willen *Ik wil…*		
Willingness Planet	…thuis spaarzaam omgaan met elektriciteit en water.	W4
	…samen met vrienden vuilnis oprapen op straat.	W9
	…enkel verzorgingsproducten gebruiken van merken die geen proeven doen op dieren.	W10
Willingness People	…kleren die ik niet meer draag, geven aan mensen die in armoede leven hier bij ons.	W6
	…een rommelmarkt organiseren en de winst schenken aan een goed doel.	W8
	…jongens en meisjes gelijk behandelen.	W11
Willingness Peace	…sociale media gebruiken zoals bijvoorbeeld YouTube om een boodschap voor vrede te verspreiden.	W1
	…op school een project tegen pesten uitwerken.	W2
	…kleren die ik niet meer draag, geven aan mensen die gevlucht zijn voor oorlog.	W7

Capacity Expectations: Vertrouwen in eigen kunnen (zelfeffectiviteit) *Ik kan…*		
Capacity Expectations Planet	…thuis spaarzaam omgaan met elektriciteit en water.	CE4
	…samen met vrienden vuilnis oprapen op straat.	CE9
	…enkel verzorgingsproducten gebruiken van merken die geen proeven doen op dieren.	CE10
Capacity Expectations People	…kleren die ik niet meer draag, geven aan mensen die in armoede leven hier bij ons.	CE6
	…een rommelmarkt organiseren en de winst schenken aan een goed doel.	CE8
	…jongens en meisjes gelijk behandelen.	CE11
Capacity Expectations Peace	…sociale media gebruiken zoals bijvoorbeeld YouTube om een boodschap voor vrede te verspreiden.	CE1
	…op school een project tegen pesten uitwerken.	CE2
	…kleren die ik niet meer draag, geven aan mensen die gevlucht zijn voor oorlog.	CE7
Outcome Expectancy: vertrouwen in impact van de actie (zelfeffectiviteit) *Ik werk mee aan een goed leven voor iedereen zonder dat het slecht is voor de planeet, als ik…*		
Outcome Expectancy Planet	…thuis spaarzaam omga met elektriciteit en water.	OE4
	…samen met vrienden vuilnis opraap op straat.	OE9
	…enkel verzorgingsproducten gebruik van merken die geen proeven doen op dieren.	OE10
Outcome Expectancy People	…kleren die ik niet meer draag, geef aan mensen die in armoede leven hier bij ons.	OE6
	…een rommelmarkt organiseer en de winst schenk aan een goed doel.	OE8
	…jongens en meisjes gelijk behandel.	OE11
Outcome Expectancy Peace	…sociale media gebruik zoals bijvoorbeeld YouTube om een boodschap voor vrede te verspreiden.	OE1
	…op school een project tegen pesten uitwerk.	OE2
	…kleren die ik niet meer draag, geef aan mensen die gevlucht zijn voor oorlog.	OE7

Appendix 5. Table A6 with study 4

Table A6. Descriptive statistics (means, and standard deviations; SD) of ACiSD and subconstructs, overall, by gender and educational level (primary and secondary)

(Sub)construct	Overall		Gender				Educational Level			
			Male		Female		Primary		Secondary	
	means	SD	means	SD	means	SD	means	SD	means	SD
ACiSD	3.95	0.56	3.82	0.61	4.11	0.44	4.02	0.51	3.73	0.66
Conceptual Knowledge	4.07	0.57	3.95	0.62	4.21	0.45	4.13	0.51	3.87	0.69
Willingness	3.93	0.66	3.76	0.72	4.13	0.51	4.03	0.59	3.62	0.75
Self-efficacy	3.86	0.61	3.76	0.65	3.98	0.51	3.91	0.57	3.69	0.70
Capacity Expectations	3.83	0.64	3.72	0.70	3.96	0.54	3.87	0.61	3.69	0.74
Outcome Expectancy	3.89	0.68	3.79	0.72	4.02	0.59	3.95	0.64	3.70	0.75

Appendix 6. Tables A7 and A8 with study 5

Table A7. Initial items of students' perceptions of their teachers' ESD implementation (inspired by Boeve-de Pauw, 2015 and Olsson, Gericke, & Boeve-de Pauw, 2022), 5-point Likert scales with a neutral centre

student ESD perceptions (18 items)	Item label	Item
Perspectives		***At our school…***
	Perspectives 1	…there is attention to different opinions in class.
	Perspectives 2	…everyone in class holds the same opinion.
	Perspectives 3	…we follow the opinions of politicians (such as the mayor, a minister,…).
	Perspectives 4	…I give my own opinion.
	Perspectives 5	…I can say so if I hold a different opinion from the teacher, my classmates, or the textbook.
Participation		***At our school…***
	Participation 1	…students can choose what we learn about.
	Participation 2	…the teacher takes into account what the students are interested in when choosing a class topic.
	Participation 3	…I, the teacher, and my classmates determine together what we learn about.
	Participation 4	…teachers ask the students' opinion on how we approach a lesson.
	Participation 5	…only the teacher decides what classes are about.
Holism		***At our school…***
	Holism1	…I learn about the connections between what things used to be like in the past, what they are like now, and what they will be like in the future.
	Holism2	…I learn about how problems here with us and global problems are connected.
	Holism3	…I learn about how the environment, people, and peace here and elsewhere in the world are connected.
Action		***My school encourages me to…***
	Action1	…go and explore outside the school as well.
	Action2	…collaborate on actions for a good life for everyone without damaging the planet.
	Action3	…learn what I can do at school to contribute to a good life for everyone without damaging the planet.
	Action4	…learn what I can do at home to contribute to a good life for everyone without damaging the planet.
	Action5	…organise an action for a good life for everyone without damaging the planet.

Table A8. ACiSD-Q items, 5-point Likert scales with a neutral centre, with mean scores and standard deviations (SD), Cronbach's alphas, and model fit of robust CFA at M1

	Item label and Cronbach's α	Item	Descriptives	
ACiSD	**α = 0.93**		**means**	**SD**
			4.03	**0.50**
Conceptual Knowledge	**α = 0.78**	***People contribute to a good life for everyone without damaging the planet if they…***	**4.14**	**0.52**
Conceptual Knowledge Planet	K4	…save electricity and water at home	4.3	0.74
	K9	…collect litter from the streets with friends.	3.9	1.02
	K10	…only use toiletries from brands that don't experiment on animals.	3.8	1.04
Conceptual Knowledge People	K6	…give clothes they don't use any more to people that live in poverty here with us.	4.4	0.71
	K8	…organise a jumble sale and donate the profit to a charity.	4.1	0.86
	K11	…treat boys and girls as equal.	4.7	0.62
Conceptual Knowledge Peace	K1	…use social media (such as YouTube) to convey a message for peace.	3.7	0.98
	K2	…develop an action against bullying at school.	4.2	0.86
	K7	…give clothes they don't use any more to people who have fled from war.	4.2	0.88
Willingness	**α = 0.83**	***I want to…***	**3.92**	**0.63**
Willingness Planet	W4	…save electricity and water at home	4.2	0.83
	W9	…collect litter from the streets with friends.	3.6	1.15
	W10	…only use toiletries from brands that don't experiment on animals.	3.7	1.15
Willingness People	W6	…give clothes I don't use any more to people that live in poverty here with us.	4.2	0.89
	W8	…organise a jumble sale and donate the profit to a charity.	3.7	1.00
	W11	…treat boys and girls as equal.	4.7	0.63
Willingness Peace	W1	…use social media (such as YouTube) to convey a message for peace.	3.3	1.09

	W2	…develop an action against bullying at school.	3.9	0.97
	W7	…give clothes I don't use any more to people who have fled from war.	4.1	0.97
Capacity Expectations	**α = 0.75**	***I can…***	**3.96**	**0.57**
Capacity Expectations Planet	CE4	…save electricity and water at home	4.2	0.87
	CE9	…collect litter from the streets with friends.	3.9	1.08
	CE10	…only use toiletries from brands that don't experiment on animals.	3.7	1.16
Capacity Expectations People	CE6	…give clothes I don't use any more to people that live in poverty here with us.	4.3	0.87
	CE8	…organise a jumble sale and donate the profit to a charity.	3.4	1.06
	CE11	…treat boys and girls as equal.	4.7	0.62
Capacity Expectations Peace	CE1	…use social media (such as YouTube) to convey a message for peace.	3.7	1.15
	CE2	…develop an action against bullying at school.	3.8	0.96
	CE7	…give clothes I don't use any more to people who have fled from war.	4.1	0.99
Outcome Expectancy	**α = 0.85**	***I contribute to a good life for everyone without damaging the planet if I…***	**4.08**	**0.63**
Outcome Expectancy Planet	OE4	…save electricity and water at home	4.3	0.76
	OE9	…collect litter from the streets with friends.	4.0	1.01
	OE10	…only use toiletries from brands that don't experiment on animals.	3.9	1.07
Outcome Expectancy People	OE6	…give clothes I don't use any more to people that live in poverty here with us.	4.3	0.81
	OE8	…organise a jumble sale and donate the profit to a charity.	3.9	0.93
	OE11	…treat boys and girls as equal.	4.6	0.71
Outcome Expectancy Peace	OE1	…use social media (such as YouTube) to convey a message for peace.	3.5	1.09

	OE2	…develop an action against bullying at school.	4.0	0.95
	OE7	…give clothes I don't use any more to people who have fled from war.	4.1	0.93
Model fit (robust CFA)	CFI 0.987	TLI 0.971	RMSEA 0.033	SRMR 0.020

Note: Robust CFA started from average scores and included covariances between conceptual knowledge of action possibilities, willingness to contribute to SD, capacity expectations, and outcome expectancy for planet, peace, and people, respectively.