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# Introduction

Globally, we as humankind are facing many ecological and social crises at the same time. Despite extensive and continual efforts aimed at transitioning towards a more sustainable society, environmental and social challenges persist or have even exacerbated in various aspects (IPCC, 2023). In transition towards a more sustainable and just society, Education for Sustainable Development (ESD) is seen as one key aspect (BMBF, 2020). ESD is a holistic educational approach, focusing on the development of sustainability competences which enable the learner to contribute to sustainable development through their competences of knowledge, skills, motivation, attitudes, and values (Rieckmann & Barth, 2022). Following the Brundtland Report and the Agenda 21 conference in Rio, numerous programs for Education for Sustainable Development have been initiated (Hoffmann, 2020). However, the impact and effectiveness of ESD is often questioned (Ssossé et al., 2021). When looking at the empirical data on the impact and outcome of ESD interventions within educational settings is very little. Despite the difficulty of attributing the desired outcome to a specific measure and the complexity of many interacting variables, the call for different approaches of measuring and operationalising ESD research, namely shifting form an input to an outcome orientation is becoming more present (Waltner et al., 2022). Basing the understanding how education interventions can be designed on empirical data, to foster sustainability competences while considering the complex modes of action, is a key topic on the agenda of educational decision makers all over the world. We currently only have a limited understanding of how participative ESD interventions, as potential enablers towards a more sustainable and just society, are contributing to sustainability competences of students.

## Education for sustainable development

### Importance/ relevance ESD

Paragraph Importance/ Relevance ESD  
🡪Important, but also controversial

* Education as crucial element in the shift towards more sustainability
* Educational efforts for this summarised under Education for sustainable development (ESD)
* ESD at the centre of the 2030 SD Agenda, key enabler of SD
* Important role ESD but also criticism

### Overview importance, relevance, difficulties measuring ESD

Approach to ESD so far   
🡪 importance of measuring outcomes ESD

* Input level: Polics level on intl, national, local levels: how succesful were those/ desired effect?
* Def ESD on local level (see EWM p.2) OR LATER?
* Not easy to measure, but important – if we want ESD to make real contribution to urgently needed changes in society
* Focus on micro-level and how to measure learning outcomes
* Output orientation: achievement of these goals? – competencies which enable the learners to contribute to real-world change OR LATER?
* Measurement instrument, which has proven to be predictive of real-world behaviour impact
* No goals/ methods defined 🡪 without operationalisation, no existent mesauring instruments, needs for ESD and effects of ESD-related interventions cannot be defined empirically
* Objectives and competencies not empirically verified 🡪 impedes effective development of ESD
* appropriate evidence-based recommendations for development of ESD research and implementation of ESD in school practice

Controversy ESD based on aims 🡪 importance to keep critical reflection

* Paragraph instrumental vs emancipatory ESD here?

Focus of article: Conducting and reflecting upon adequate measurement of sustainabilty competences for real world change

## Theoretical and conceptual context

### Goals of ESD

When wanting to improve ESD, importance of setting goals   
🡪 Measuring/ operationalisation goals SC according to tripartite structure seems relevant

Goal not only wanting to improve ESD, but to actually improve outcomes?

#### Input goals

* Existing goals
  + Regional education plans or
  + International framework SDGs (Agenda 21), but no operationalisation ESD output, but normatively well founded

#### Competencies

* Competencies (HERE?) – intro sustainability competencies
  + Definitions
    - Based on Weinert’s concept of competency [[**25**](https://www.mdpi.com/2071-1050/11/6/1717#B25-sustainability-11-01717)], we determine “sustainability competencies as the overarching goal of ESD. Sustainability competencies compromise the entirety of cognitive abilities and skills as well as related motivational, volitional and social readiness in order to solve sustainability-related problems and to shape sustainable development in private, social and institutional contexts” ([[**14**](https://www.mdpi.com/2071-1050/11/6/1717#B14-sustainability-11-01717)], p. 299). This is largely consistent with the following understanding of sustainability competencies: “Sustainable development and social cohesion depend critically on the competencies of all of our population—with competencies understood to cover knowledge, skills, attitudes and values”, defined by the OECD Education Ministers [[**26**](https://www.mdpi.com/2071-1050/11/6/1717#B26-sustainability-11-01717)] and other literature on (E)SD competencies (see for example [[**27**](https://www.mdpi.com/2071-1050/11/6/1717#B27-sustainability-11-01717),[**28**](https://www.mdpi.com/2071-1050/11/6/1717#B28-sustainability-11-01717)]).

#### Tripartite frame-model

* Operationalisation Goals should be structured and related to each other (Frame model from Riess)
* Based on three dimensions (Rieckmann, Waltner)
  + Behavioral dimension absent in other definitions! (Lambrechts et al)
  + Model: That’s why three dimensions of model (+ allows allows daaptivity for specific contexts) + counteracts the prominent dominance of cognitive dispositions
    - Level of model?
    - At each level, a distinction is made between cognitive (a), affective-motivational (b), and behavioral (c) aspects, and additional subcompetencies (d).
    - Description of each dimensions? See EWM development
    - Differentiation from non-sustainability related competences

### Operationalisation ESD output

What to measure when looking at actual outcomes   
🡪 look at behavioral and attitudinal dimension

Competencies that contribute to real-world change

* + Research exists for goals. But not for adequate measurement instruments
  + Operationalisatoin attempts availale from other research disciplines (+ exisint qualitative data)

#### Established indicators knowledge dimension

Knowledge-behaviour gap

* Operationalising ESD outcomes (Measurement and Sustainablity competences)
  + - Well established measurement procedures facilitate the itnegration of already operationalised facets of competencies (e.g. attitude) into the larger contruct of sustainablity competences
    - Cognitive/ knowledge dimension:
      * knowledge scales are already available. only specific parts of sustainability knowledge (e.g., environmental knowledge) as a significant subset of sustainability knowledge (e.g., Frick et al., 2004; Maloney & Ward, 1973; McBeth et  al., 2011; Roczen et al., 2014).
      * However, although environmental knowledge is found to be consistently and positively related to environmental attitudes, the relationship is not especially strong (e.g., Arcury, 1990).
      * Behavior prediction through knowledge quite low (Frick 2004), but also indirect (Kaiser, 2003). 🡪 knowledge basis for behaviour, but missing relevant motivational factors

#### Established indicators affective-motivatonal dimension (including Campbell paradigm)

* + - Affective-motivational domain
      * Greenpeace Sustainability Barometer [[**60**](https://www.mdpi.com/2071-1050/11/6/1717#B60-sustainability-11-01717),[**61**](https://www.mdpi.com/2071-1050/11/6/1717#B61-sustainability-11-01717)], the Sustainable Development Values-Scale [[**62**](https://www.mdpi.com/2071-1050/11/6/1717#B62-sustainability-11-01717)], the 2-MEV scale (or also the Preservation and Utilization-Scale) [[**63**](https://www.mdpi.com/2071-1050/11/6/1717#B63-sustainability-11-01717),[**64**](https://www.mdpi.com/2071-1050/11/6/1717#B64-sustainability-11-01717),[**65**](https://www.mdpi.com/2071-1050/11/6/1717#B65-sustainability-11-01717),[**66**](https://www.mdpi.com/2071-1050/11/6/1717#B66-sustainability-11-01717)]. Items from earlier measurement tools emerging from environmental science or environmental psychology may be helpful in the search, especially for the environmental dimension of SC, for example Kaiser et al.’s scale for Environmental Attitude or Connectedness to Nature [[**57**](https://www.mdpi.com/2071-1050/11/6/1717#B57-sustainability-11-01717),[**67**](https://www.mdpi.com/2071-1050/11/6/1717#B67-sustainability-11-01717),[**68**](https://www.mdpi.com/2071-1050/11/6/1717#B68-sustainability-11-01717)] or on environmental values, beliefs, and concerns, or environmental literacy [[**69**](https://www.mdpi.com/2071-1050/11/6/1717#B69-sustainability-11-01717),[**70**](https://www.mdpi.com/2071-1050/11/6/1717#B70-sustainability-11-01717),[**71**](https://www.mdpi.com/2071-1050/11/6/1717#B71-sustainability-11-01717)]; see also the revised New Ecological Paradigm (NEP) Scale [[**72**](https://www.mdpi.com/2071-1050/11/6/1717#B72-sustainability-11-01717)].Empirical data and self-reported
    - Affective-motivational dimensions and behaviroal
      * Close connection
      * No behaviour if costs are perceived too high (Campbell paradigm)  
        🡪 behavioral self-reports used as indicators for a person’s attitudes
      * Operationalisation of attitude and behaviour dimensions in various scales (see Waltner p.2)
  + Campbells paradigm vs TPB

#### Link to behaviour/ links between

* + - Behavioral dimension
      * In a societal context, it is first and foremost about promoting the ability to act. This is exemplified in the work undertaken mainly by researchers from environmental psychology [[**73**](https://www.mdpi.com/2071-1050/11/6/1717#B73-sustainability-11-01717),[**74**](https://www.mdpi.com/2071-1050/11/6/1717#B74-sustainability-11-01717),[**75**](https://www.mdpi.com/2071-1050/11/6/1717#B75-sustainability-11-01717),[**76**](https://www.mdpi.com/2071-1050/11/6/1717#B76-sustainability-11-01717),[**77**](https://www.mdpi.com/2071-1050/11/6/1717#B77-sustainability-11-01717)], for example, the General Ecological Behavior (GEB)-scale [[**67**](https://www.mdpi.com/2071-1050/11/6/1717#B67-sustainability-11-01717),[**68**](https://www.mdpi.com/2071-1050/11/6/1717#B68-sustainability-11-01717)].
* Methods for measuring goal dimensions:
  + Exising examples (and also using frame-model)
    - Knowledge covered in article
    - Mention subcomepetencies?
    - Additionally, an important theoretical background for the test construction in the framework of our study, as well as for hypothesis formulation, were studies emerging mainly from environmental psychology that dealt with the interconnections and influence patterns of environmental knowledge, environmental attitudes, and environmental behaviors (see for example [[**57**](https://www.mdpi.com/2071-1050/11/6/1717#B57-sustainability-11-01717),[**64**](https://www.mdpi.com/2071-1050/11/6/1717#B64-sustainability-11-01717),[**65**](https://www.mdpi.com/2071-1050/11/6/1717#B65-sustainability-11-01717),[**66**](https://www.mdpi.com/2071-1050/11/6/1717#B66-sustainability-11-01717),[**67**](https://www.mdpi.com/2071-1050/11/6/1717#B67-sustainability-11-01717),[**68**](https://www.mdpi.com/2071-1050/11/6/1717#B68-sustainability-11-01717),[**69**](https://www.mdpi.com/2071-1050/11/6/1717#B69-sustainability-11-01717),[**70**](https://www.mdpi.com/2071-1050/11/6/1717#B70-sustainability-11-01717),[**71**](https://www.mdpi.com/2071-1050/11/6/1717#B71-sustainability-11-01717),[**72**](https://www.mdpi.com/2071-1050/11/6/1717#B72-sustainability-11-01717),[**73**](https://www.mdpi.com/2071-1050/11/6/1717#B73-sustainability-11-01717),[**74**](https://www.mdpi.com/2071-1050/11/6/1717#B74-sustainability-11-01717),[**75**](https://www.mdpi.com/2071-1050/11/6/1717#B75-sustainability-11-01717),[**76**](https://www.mdpi.com/2071-1050/11/6/1717#B76-sustainability-11-01717),[**86**](https://www.mdpi.com/2071-1050/11/6/1717#B86-sustainability-11-01717),[**87**](https://www.mdpi.com/2071-1050/11/6/1717#B87-sustainability-11-01717),[**88**](https://www.mdpi.com/2071-1050/11/6/1717#B88-sustainability-11-01717),[**89**](https://www.mdpi.com/2071-1050/11/6/1717#B89-sustainability-11-01717),[**90**](https://www.mdpi.com/2071-1050/11/6/1717#B90-sustainability-11-01717)]).

#### Link TPB? (Similarities/ differences?)

Existing reseach based on ESD outcomes

Choosing best methods for capturing SC   
🡪 importance empirical data  
🡪 long-term  
🡪 attribution to intervention (through control group)  
🡪 validation with other scale to check for actual behavior?

* Using self-reports

CHECK PAPER: Current practice of assessing students’ sustainability competencies: a review of tools  
<https://link.springer.com/article/10.1007/s11625-020-00855-1>

Results Bugen, Pauli etc here

#### Importance long-term empirical data

#### Challenge: attribution to intervention

Here choosing relevant methods from moni article?

#### Importance validation for real world behaviour change?

* + Ideal would be observational data
  + Reality:self-reports more frequently used
    - Advatanges: easier to obtain, especially large qunatities, broader assessment of different behaviours (aggregrated measurements of behavioral classes)
    - BUT Gap between self-reported behaviour and objective behaviour 🡪 indicators mesaure outcome of ESD have tob e validated as to their congruence with real-life outcomes (as real-life relevant for shift to more sustainable socieety/ decision)
    - Underlying: behaviour outcome can and should be goal of ESD??!
  + Long-term (longitudinal) data (from input to output orientation!)
    - Some effects (teaching, whole school approach) only visible long-term + commpexity of interaction of many variables
  + Comparision of design/ form of intervention (involvement of students), compared to research that just looks at development through a year
  + Measuring relevance
    - Bottom-up approach thorugh students and teachers and their decision of what is relevant – backing up through empirical data
    - Interdisciplinary SC

For sound method of SC   
🡪 validation with self-efficacy

* + - Conceptual examination
      * Newly developed measurement project and established ones
      * Campbell paradigm and the type of questions used! See Waltner p.213
      * For me: Validated through simililarity in questionnaires with validated „new“ measurement tool EWM?
    - Through other scale
      * Using other already validated scale
      * Competency differences which were assessed by mesaurement instrument could point toward differences between students
      * When using two scales (as I did, report r) 🡪 the two scales measure the same latent construct
    - Support for Campbell paradigm: attitudes can be derived from verbal acts and self-reports. Not necessary those specific ones, but could be any well-phrased ones 🡪 higher priority of specific objectivity within validation criteria for measurement in general
  + Validation through prediction of impact-relevant behaviour
    - Joining group as behavioral manifestation (in EWM case FFF participation)
    - Proxy for actual behaviour

Use joining group as actual behaviour in my case??

### Using self-efficacy as indicator for validation

* Which of these aspects in discussion??!
* What to measure and why? Individual and then collective behavior? (within framing of defining and measuring ESD outcomes?)
  + Why is it relevant to measure self-efficacy
    - Whole-institution
    - Better goal/ outcome (moral side) out education intervention(goal desirability)
    - Better predictor of behavior?
    - Importance of collective as well? Agencies!
    - To counteract negative climate emotions
    - Discussion: actual shift of power
    - Useful in terms of context sensitivity?
    - Method of project corresponds to recommendations methods Riess (importance feedback environment!)

#### Link self-efficacy and actual behaviour

Include def here?

* + - * Predictive power for behaviour/ behavioural intentions:
        + Agent-action link and agent-action-aim link have independent predictive power
        + Regarding their predictive power for behavior and behavioral intentions, most studies find that self-efficacy with an agent-action link and an agent-action-aim link have independent predictive power ([Doherty & Webler, 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr98-10888683231178056); [Hunter & Röös, 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr168-10888683231178056); [Y.-J. Lee, Haley, & Yang, 2017](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr219-10888683231178056); [Y. Li & Zhong, 2017](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr222-10888683231178056); [Truelove, 2009](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr347-10888683231178056)). One study also found both self-efficacy with an agent-action and agent-aim link to predict behavioral intentions ([Perrault & Clark, 2018](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr261-10888683231178056)). However, there were also two studies showing that only agent-action self-efficacy and not agent-action-aim self-efficacy ([Lam & Chen, 2006](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr209-10888683231178056)) or only agent-action-aim self-efficacy but not agent-action self-efficacy ([Kautish et al., 2019](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr187-10888683231178056)) continued to be a significant predictor when entered into models simultaneously. One study indicated that none of the efficacy links was predictive of behavioral intention when other variables such as subjective norms were included ([Choi & Johnson, 2019](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr75-10888683231178056)).
        + Interestingly, we found no study reporting agent-aim and agent-action-aim self-efficacy as different predictors in one model. Yet, the study by [Reese and Junge (2017)](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr270-10888683231178056) suggests that correlations with behavior might be very similar and might depend on the level of abstraction, with agent-action-aim self-efficacy potentially being a little more predictive of concrete (plastic consumption) intentions, and more general agent-aim self-efficacy being more predictive of a more general intention. In sum, our review of discriminant and predictive validity indicates that agent-action self-efficacy is distinguishable from agent-aim and agent-action aim self-efficacy. Yet, some inconsistent findings suggest that the results are not conclusive either. As only one study allowed us to make an agent-aim and agent-action-aim comparison, we cannot yet draw conclusions about their empirical distinctiveness nor can we know which characteristics of agents, actions, and aims led to stronger or weaker interdependence between these links

#### Importance/ relevance self-efficacy beliefs (also as outcome!)

Overview framework

* Self-efficacy can be organised along the lines of agent-action-aims
  + Strong and urgent need to pursur large-scale social and ecological aims
  + Need for collective agents! Human agency as motivating people toa ct. Agency based on self-efficacy beliefs
  + Def: belief in ones capabilities to organise and and execute the courses of action required to produce given attainments
  + Field lacks commprehensive framework, but important to understand how individuals and collectives can experience more self-efficacy and act together against social and ecological crisis
  + Theory based on Bandura and being capable of agentic actions
  + Various personal and collective approaches to motivation
  + TPB, as one theory featuring notions of (individual) self-efficacy
    - Especially percieved behavior control
  + Clear guidelines missing on how to operationalise self-efficacy in the context of collective social and ecological aims
  + Can be organised along the lines of agents, actions, aims
    - Agent
      * Personal self or group (based on person’e self concept due to social and emotional group membership)
      * Signals possibility of being able to affect changes
      * Allows for shift between group and self-efficacy
    - Intentional action
      * Intentionally creating and altering the world around them
      * Acttion as any behavior that is time-a dn space bound, measurable, observable, ready tob e performed intentionally
      * Intentional, directed towards aim
      * Actual intentionality or imagined intentionality („if I want to“
      * Can be characterised by their level of self-determination, abstraction, their content
    - Desirable aim
      * Cognitive representation of desired personal or collective outcome
      * Chracteristics: long-term, abstract, purpose.driven
      * Aims direct people’s attention, produce motivational energy, create persistence, foster skill development (Locke, latham, 2002)
      * Self-efficacy and aims influence each other in complex bidirectional ways
      * Importance of desirablity of aim!
  + Linking three As
    - * Distinguishing three self-efficacy links (agent-action, agent-action-aim, agent-aim) – all different types of self-efficacy, see Table 4!
      * Reflected in our definitions and examples is the idea that self-efficacy theory is a theory of beliefs about self-regulated action and aim achievement ([Schwarzer & Schmitz, 1999](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr295-10888683231178056), as cited in [Homburg & Wagner, 2007](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr160-10888683231178056)). This is incorporated by the marker word “can,” combined with a self-categorized agent, an intentional action, and a desirable aim.
      * 3 links can diverge or align, depending on context of interest
    - 3 advantages triple A
      * Self-efficacy as self-categorised efficacy belief
        + Allows distinction self/ collective, clears
        + Individuals can flexibly shift from categorising themselves as individuals to members of groups (Coking, Fritsche, Tajfel) (different social identity underlying)
      * Includes intentional actions and desirbale aims: laying ground for categorising aim content
        + Collective efficacy was better predictor of pro-evironmental behaviour than self-efficacy ((M-F Chen, 2015)
        + Adding to this, [Hornsey et al. (2006)](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr162-10888683231178056) found that, depending on aim content, members and non-members of a protest group differed in how self-efficacy predicted their action intentions. Several studies included aims in their efficacy measures that were not directly targeting social or environmental issues (e.g., saving money or being healthy, see [Table 7](https://journals.sagepub.com/doi/10.1177/10888683231178056#table7-10888683231178056)). Ignoring the different natures of the aim contents might lead to seemingly incoherent findings and mask the driving principles ([Koletsou & Mancy, 2011](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr202-10888683231178056)).
        + Desirability of aim! If an aim is not desirable but rejected, a self-efficacy measure may trigger defensiveness and capture only the value of the aim (see also [Castiglione, 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr58-10888683231178056)).
        + Therefore, according to [Williams and Rhodes (2014)](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr387-10888683231178056), it might be necessary to add the component “if you want to” to action-focused self-efficacy items to make sure that participants are thinking about an intentional action and as a way to avoid predicting behavioral intentions with another construct capturing intention.
      * Includes aim-focussed self-efficacy
        + Field of collective social and ecological aims is especially prone to aim-fiocussed understanding of self-efficacy because it fits complex nature of collective crisis (Zomeren,2019)
        + For collective aims, the hardest part is not performing an action as such (e.g., going to a protest) but creating social change *with* this action. Individuals only have a very limited amount of control over collective outcomes ([Hornsey et al., 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056); [Jugert et al., 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr183-10888683231178056)). Moreover, many barriers lie outside of the individual and are informed by the actions of powerful others; feedback is much more difficult to receive as aims are rather distal (e.g., the impact of an awareness campaign on people’s opinions is difficult to detect; [Hornsey et al., 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056)).[3](https://journals.sagepub.com/doi/10.1177/10888683231178056#fn3-10888683231178056)
        + Many actions could (or not) lead to one aim
        + Disctincion aim-focused and action focused self-efficacy

#### Operationalisation self-efficacy beliefs

* + Almost no empirical data on links + personal/ collective
  + One study reporting very high correlations between efficacy links on both levels (CHECK REESE AND JUNGE)
  + Operationalisation
    - * I/ relevant ingroup – interesting for education aim!
      * Action should refer to capability in the present moment, so people do not judge future abilities
      * Pilot-studies to test desirable aims
      * Most useful for behavioral predictions
        + Include both agents as social identity is central tot he context oft he study

Personal more strongly related to private action, ingroup with activism

* + - * + Actions and aims should be adapted to outcome variables (which is the category of interest?)
        + Distinguish action- and aim links

Combining actions that are very concrete

With very abstract collective aims

With ingroup no agent-action

Collective vs individual self-efficacy

<https://www.mdpi.com/2071-1050/9/2/200>

For example, Barth and colleagues [[**8**](https://www.mdpi.com/2071-1050/9/2/200#B8-sustainability-09-00200)] analyzed intentions to use electric vehicles both in a purchasing and sharing scenario. Among other predictors such as descriptive and ingroup norms, personal cost-benefit analyses, knowledge and experience, collective efficacy was assessed and predicted stronger intentions both in the purchasing and the sharing scenario. Similarly, collective efficacy beliefs were more strongly connected to the choice of a more environmentally sustainable travel option than self-efficacy beliefs [[**10**](https://www.mdpi.com/2071-1050/9/2/200#B10-sustainability-09-00200)]. These authors also showed environmental collective efficacy beliefs to be a stronger predictor of peoples’ willingness to pay for environmental protection than self-efficacy and attitudes [[**9**](https://www.mdpi.com/2071-1050/9/2/200#B9-sustainability-09-00200)]. Morton and colleagues [[**28**](https://www.mdpi.com/2071-1050/9/2/200#B28-sustainability-09-00200)] assessed collective efficacy as individual’s perception of their group being efficacious in mitigating or dealing with the consequences of climate change. Here, collective efficacy was a significant predictor of private-sphere environmental actions (i.e., reducing household waste and non-green energy consumption). Earlier, Homburg and Stolberg [[**29**](https://www.mdpi.com/2071-1050/9/2/200#B29-sustainability-09-00200)] found that appraisals of collective efficacy, rather than self-efficacy, predicted pro-environmental intentions (see also [[**30**](https://www.mdpi.com/2071-1050/9/2/200#B30-sustainability-09-00200)]). While this evidence suggests that we should focus on collective efficacy in order to promote sustainable behavior, more recent evidence by Jugert and colleagues [[**12**](https://www.mdpi.com/2071-1050/9/2/200#B12-sustainability-09-00200)] suggests that a better understanding of the mechanisms linking efficacy perceptions and sustainable behavior is needed.

Aim vs action

* In Banduras theories, mix of labelling, also less relevant
* More relevant in field of collective social and ecological aims 🡪 fits complex nature of collective crisis (Van Zomeren, 2019),
  + Difficulty not performing action, but creating social change with action
  + Many barriers outside the individual
  + Looser action-aim continegencies (abundance of acitons relevantfor crisis) 🡪 don’t have to restrict to specific set of actions
* 🡪 aim and action focussed self-efficacy should be distinct

## Objectives and research questions

My aim is to quantify how ESD interventions influence students’ sustainability competences over time. Existing empirical data of a defined external ESD intervention project of climate attitudes and climate behaviour (Pauli, 2023) and the opportunity for continuous data collection allow for long term assessments of sustainability competences over time. Recent theoretical developments on self-efficacy beliefs provide a new possibility to enrich the measurements with these aspects. By integrating previous quantitative research from two schools with current, and theoretically comprehensive data collection at the same two schools, my analysis provides insights into the effectiveness of ESD projects in enabling human agency/ sustainability competences of high school students.

* 1. How do climate attitude and climate behaviour of students change over time (including one year after the end of a ESD intervention)?
  2. How do climate attitude and behaviour respond to levels of involvement of the students?
  3. How is climate attitude and behaviour influenced by self-efficacy beliefs?
  4. How do self-efficacy beliefs respond to levels of involvement of the students?

+ overview?

## Research hypotheses and predictions

1. A graph with arrows pointing to a group

   Description automatically generatedPredictions

A diagram of a diagram

Description automatically generated **B)** Workflow