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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 ELIGIBILITY, impact and effectiveness of ESD is often questioned (Ssossé et al., 2021). If the aim of ESD is to make real contribution to urgently needed changes in society, appropriate evidence-based recommendations are needed. When looking at the empirical data on the impact and outcome of ESD interventions within educational settings is very little. Disentangling the goals, methods and outcomes of ESD and establishing effective education without instrumentalising education is an urgent issue. Currently, we only have a limited quantitative understanding on how education, such as ESD interventions, influence the development of sustainability competences over time on the micro-level. Despite the call for more encompassing test for measuring and operationalising ESD research, namely shifting form an input to an outcome orientation (Waltner et al., 2022), research has mostly focussed on “old” methods (BUGEN), and uncomprehensive dimensions (PAULI, ..?). Recent theoretical advances of sustainability competences, such as the triple A framework of self-efficacy beliefs (SW), together with the opportunity to capture long-term empirical data (Pauli) allow us to quantitatively test ESD interventional effects on students’ sustainability competences. Sustainability competences measurement linked to effective ESD education can provide the information and educational design instructions needed for better educational policy making in the light of our rapidly changing Anthropocene.

## Theoretical and conceptual context

### Goals of ESD

Make importance measurement clearer here as well??

Identifying effective means// Sustainability competences depend on the goals and objectives/ competencies (REFS). On an international stage, the goals are set by for example the Agenda 21. They provide a normatively well founded framework, but there is no operationalisation of the ESD output. On the local scales regional education plans exists, give example BaWü?. see, e.g., the definition of ESD on the local level: Education for Sustainable Development enables learners to make informed decisions and act responsibly for the protection of the environment and for a functioning economy and a just world society for current and future generations (Ministry of Education BadenWürttemberg, 2016, translated by the authors). Educational goals, which are personal characteristics to promote in learners, should include a normative test and an empirical test (UHL). Critical analyses of prominent ESD goal recommendations proposed sustainablity competences, as „cognitive abilities and skills as well as associated motivational, volitional, and social readiness needed to be able to solve sustainability-relevant problems and shape sustainable development in private, social, and institutional contexts. (WEINERT)”. Although some ESD learning goals exist, there is still a lack in terms of operationalisation of ESD output (RIESS/MISCHO) to be translated into measurement models and tools. Drawing on empirically verified measuring instruments and approaches from related disciplines, allows to integrate operatinalised facets of competencies into ESD context. As such, ESD learning goals need to be structured and related to each other. One prominent framework is the tripartite frame-model for sustainability competencies (RIESS) which comprise of cognitive, affective motivational and the behavioural aspects (e.g., Rieckmann, 2018; Waltner et  al., 2019). DESCRIBE EACH DIMENSION BRIEFLY HERE. The framework has the advantages of including the behavioral dimensions (Lambrecht et al), being adaptable to different contexts and counteracts criticisms of the dominance of cognitive dimensions. Thus, to **measure/foster** sustainability competencies and identify effective means, it is important to understand changes on the goal dimensions of cognitive, affective motivational and behavioral aspects //use the tripartite frame model as goals and objectives.// // Goal of ESD are SC with goal dimensions x/y/z

### Operationalisation ESD output

*Research offers many possibilities for mapping the goal dimensions of ESD. For empirical measurement, the competencies must be defined with sufficient precision. Such a specification allows, in principle, the operationalization of the competency of interest in an appropriate measurement procedure (see Klieme & Hartig, 2007). There is still a need for developing adequate measurement instruments fort he various dimensions of SC. Connecting ESD research to well-established measurement procedures facilitates the integration of already operationalized facets of competencies (e.g., environmental attitude) into the larger construct of SCs (sustainability competencies). Some operationalization approaches in the field of ESD exist for specific regions, applying mainly qualitative methods (for example [*[***13***](https://www.mdpi.com/2071-1050/11/6/1717#B13-sustainability-11-01717)*]).* When considering related disciplines, for each of the three goal dimensions examples of measuring approaches exist (REF), for example in the the cognitive dimensions of sustainability knowledge (REF) 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)., the Greenpeace Sustainabiltiy Barometer for the affective motivational domain, General Ecological Behavior Scale for behavioral dimension. Recent research has tried to combine these scales and adapt them to school context.

At the same time, the question remains in how far the indicators can capture the ultimate normative goal of ESD: the actual development of a more sustainable society through sustainable behaviour (see also local definition!). *Theories of action from the field of psychology are based on the basic assumption that various forms of knowledge and motivational factors (including subjective and social norms, attributions of responsibility) can interact and lead first to the formation of behavioral intentions and then to behavior that is relevant to sustainability [*[***46***](https://www.mdpi.com/2071-1050/14/7/3708#B46-sustainability-14-03708)*] In addition to these internal factors, external conditions (e.g., behavioral offers, situational conditions, social norms, and lifestyle of the social environment) also influence sustainability-relevant behavior. Thus, by promoting knowledge and motivational orientations, in turn, the desired behavior can also be promoted. Nevertheless, research has repeatedly demonstrated a considerable gap between knowledge, motivational orientations, and actual sustainability-promoting behavior [*[***47***](https://www.mdpi.com/2071-1050/14/7/3708#B47-sustainability-14-03708)*].* Especially, when looking at the cognitive goal dimension, sustainability knowledge is found to be positively related to sustainability attitudes Arcury, 1990)., but the behavioral prediction is quite low (Fricke 2004). Knowledge can be considered as a more indirect predictor of behaviour, as a basis, but it is missing the relevant motivational factors. The often cited knowledge-behviour gap. *In this regard, Kagawa states that “[t]here are multiple factors which influence the process of behavioral change and further investigation of dissonance between students’ perception of sustainability and their individual actions needs to be explored” [*[***106***](https://www.mdpi.com/2071-1050/11/6/1717#B106-sustainability-11-01717)*]. See, for example, research on the attitude–behavior gap [*[***103***](https://www.mdpi.com/2071-1050/11/6/1717#B103-sustainability-11-01717)*,*[***107***](https://www.mdpi.com/2071-1050/11/6/1717#B107-sustainability-11-01717)*,*[***108***](https://www.mdpi.com/2071-1050/11/6/1717#B108-sustainability-11-01717)*] or cognitive dissonance [*[***109***](https://www.mdpi.com/2071-1050/11/6/1717#B109-sustainability-11-01717)*,*[***110***](https://www.mdpi.com/2071-1050/11/6/1717#B110-sustainability-11-01717)*]*. *Accordingly, for the affective-motivational and behavioral dimension, a very close connection has been proven by various studies. Affective goal commitment or a positively valued sequence of actions is the core of every motivation. An action is not carried out if the costs are perceived as too high when compared to the affective goal commitment. This attitudecost relationship is modeled in the Campbell paradigm (Kaiser et al., 2010), which implies a solid link between a person’s attitudes and his or her behavior. Consequently, in the framework of the Campbell paradigm, behavioral self-reports are used as indicators for a person’s attitudes.* PUT EXAMPLES INDICATORS HERE (SEE APPLICATION OPERATIONALISATION). When operationalising the SC most relevant to real-world behaviour, the dimensions of sustainability attitude and self-reported sustainability behaviour are the most relevant.

#### Link TPB

Campbells paradigm vs TPB?

Sustainability competences as behaviour is bringing up the question on underlying theories of behaviour. Empirically, some of the most often used models for sustainability relevant behaviour were the theory of planned behaviour (TPB) and the NAM (Bamberg, Möser, 2007; Sopha 2011, Klöckner 2013). The TPB is also one of the most prominent approaches from the from-within side (ertz, 2016). *Intention and perceived behavioural control (PBC) are seen as direct determinants of behaviour (Ajzen, 1991, p. 184). Intention, in turn, is also influenced by the PCB, but also by two other factors. Firstly, the attitude towards the behaviour in question and secondly, subjective norms have an effect on behavioural intention (ibid., p. 188). Behind these determinants are beliefs or convictions that relate to behaviour, norms and control (ibid., p. 189). TPB being a rational choice theory, the focus here is on the self-interest of the person, who weighs up what consequences the action will have for them (Kaiser et al., 2006, p. 2151). Kaiser et al. tested the explanatory power of the TPB for pro-environmental behaviour (2006, p. 2160). According to this study, the three "[...] determinants, attitude [...], subjective norms [...] and perceived behavioural control [...] explain 76% of the variance in behavioural intention" (ibid.), while these in turn explain "[...] 95% of the variance in a person's environmental protection behaviour" (ibid.). However, in a meta-analysis by Armitage and Conner, this average is significantly lower at 27% variance clarification (Armitage & Conner, 2001, p. 471). On the downside, the directions of effect between attitudes, subjective norms and perceived behavioural control remain incompletely identified in the TPB (Kaiser et al., 2006, p. 2165).* Furthermore, it is critiqued for the focus on internal factors, such as knowledge and attitudes and comes short in considering structural barriers, power relations and inequalities, that pose systemic barriers to an individual (Bamberg, 2021), as well as moral and normative considerations (Kaiser, 2006). *With regard to the link between the operationalised goal dimensions of sustainability attitude/ affective-motivational and sustainability behavioural dimensions, the attitudes and subjective norms can be assigned to the affective dimensions, while PBC and intentions represent motivational aspects (Weber, 2008). For the operationalisation in the context of this study, (due to previously existing data) the TPB was used. The Theory of Planned Behavior, which predicts behaviour by capturing four variables, is used for operationalisation. The four variables on the first and second causal levels are summarised here as climate attitude/ affective-motivational dimensions.* Therefore, sustainability competences and the dimensions of climate attitude and climate behaviour can be operationalised with the components of the theory of planned behaviour.

Methods operationalisation

**Split in two:   
🡪 importance long-term and empirical data  
🡪 quasi-experimental design and innovative ESD learning method**

Operationalised sustainability competencies and their contribution to an ESD intervention can be assessed using different methods. Generally speaking, there is little empirical data (REFS). *Methodologically quantitative research projects can make a very important contribution to the normative debate, through empirical insights.* *The exemplary outcome indicators shown in this study, with the longitudinal data at the level of the pupils, provide ESD stakeholders with a useful information base (cf. e.g., DIPF, 2007; Oekes, 1989).* (ESD stakeholders also including teachers) Importance of not only referring to plausible and normative considerations and assumptions). *Some effects of the educational measures (e.g., teaching, whole institutional approach) might only be empirically verifiable in the long term or in general not clearly be attributable to a specific measure, due to the complexity of the interaction of many variables affecting, for example, sustainability awareness. These considerations show that when shifting the attention from the Input to the Output orientation of ESD measures, we might need more long-term assessments and additional method orientations to evaluate the impact. Until now, empirical data on the long- as well as the short-term impact of ESD initiatives within educational settings is scarce.*

The existence of empirical data is limited to certain types of learning/teaching methods of ESD. While there is a big call for alternative and innovative methods for conducting ESD, especially their effectiveness is not evidenced empirically. So far innovative ESD intervention’ studies only/mostly comprise of results of studies in form of self-reports, self-assessments and expert surveys (REF MONI). *In addition, the results of two empirical studies were presented as evidence of effectiveness. One of these studies was conducted within an ex post design [*[***21***](https://www.mdpi.com/2071-1050/14/7/3708#B21-sustainability-14-03708)*] and the other within a pre-experimental research design [*[***27***](https://www.mdpi.com/2071-1050/14/7/3708#B27-sustainability-14-03708)*], which are non-experimental research methods. In contrast to the non-experimental research methods stated above, quasi-experimental studies can be used for testing hypotheses and thus provide evidence for the effectiveness of methods.* So far these robust scientific methods have only been used for ESD intervention methods with a high degree of guidance by the teacher*. In addition, the validity of quasi-experiments can also be increased with experimental control (e.g., pre–post or control-group test design, two or more treatment groups, control of possible confounding variables, and documentation of the reliability of the measuring instruments) [*[***38***](https://www.mdpi.com/2071-1050/14/7/3708#B38-sustainability-14-03708)*].* Based on the lack of empirical data, no concluding statements about the “best” teaching/learning methods can be made yet, recommendations exist from the empirical educational and teaching research. To promote motivational/attitudes*, role playing, simulation games, learning from models (observation and imitation learning), value clarification, projects and internships in contexts relevant to sustainability, and the formation of student parliaments in which the learners participate in decisions on matters relevant to sustainability are recommended.*  Methods for promoting behavioural readiness?. Given the mismatch of unevidenced-based recommendations of type of ESD interventions with sound methods and availablitliy of research, empirically and quantitatively measuring innovative ESD methods, with quasi-experimental design (which allows for contribution to intervention through control group) is highly needed.

### Using self-efficacy as indicator for 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??!
  + Measuring relevance
    - Bottom-up approach thorugh students and teachers and their decision of what is relevant – backing up through empirical data
    - Interdisciplinary SC

Armitage & Conner, 2001, S. 476). Bei der Erfassung der Einstellungen, Intentionen und Verhalten ist auch unter Anwen-dung von Multi-Item-Skalen mit einem Problem zu rechnen, das nicht durch das Instru-ment selbst hervorgerufen wird. Es handelt sich bei den erfassten Daten meist um von den befragten Personen selbst berichtete Aussagen, nicht um Beobachtungen. Hier be-steht demnach vor allem bei Fragen nach ihren Einstellungen, Intentionen und Verhalten die Gefahr, dass die Befragten sozial erwünschte („socially desirable“) Antworten liefern (ebd., S. 476).

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
    - * For example, the explanatory power of the theory of planned behavior ([Ajzen, 1991](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr6-10888683231178056)) could benefit from considering agent-aim efficacy beliefs, as in a study by [Bamberg et al. (2015](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr24-10888683231178056), see also [Huijts et al., 2013](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr166-10888683231178056)). As the theory of planned behavior typically focuses on a precise behavioral outcome, an agent-action-aim efficacy may be most appropriate according to the triple-A framework.
    - Joining group as behavioral manifestation (in EWM case FFF participation)
    - Proxy for actual behaviour

Use joining group as actual behaviour in my case??

SELF-EFFICACY AS INDICATOR LINKS

* 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

RIESS to promote changes in behavior, teachers at schools and universities should raise awareness (and problematize) their students’ action-guiding ideas and assumptions (subjective theories) and foster their self-efficacy so that they believe their actions have an effect.

#### 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

* + - * Efficacy agents
        + While correlational studies typically find that self-efficacy predicts private behaviors and participative efficacy predicts activist behaviors ([Hamann & Reese, 2020](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr143-10888683231178056); [Morton et al., 2011](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr243-10888683231178056)), experimental studies suggest that ingroup efficacy interventions outperform personal self-efficacy interventions in influencing actions (e.g., [Jugert et al., 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr183-10888683231178056)). Causal investigations of their relations are needed for both theorizing and drawing practical conclusions. These investigations could, for example, test whether the path from collective to individual self-efficacy to private behavior, as proposed by [Jugert et al. (2016)](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr183-10888683231178056), is causally replicable (see also [Cocking & Drury, 2004](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr82-10888683231178056); [Reese & Junge, 2017](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr270-10888683231178056)).
        + Moreover, self-projection might cause personal self-efficacy and ingroup efficacy scales to overlap strongly. It could be valuable to test under which conditions our assumption holds that behavior is better predicted when including both personal and collective agents.
        + Second, research could focus on which ingroup efficacy agents are more or less important in specific social and ecological crises. Social identity theory ([Tajfel, 1978](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr330-10888683231178056)) provides a basis for characterizing and systemizing various ingroup *efficacy agents*. Therein, ingroup norms and group size might (interactively) influence the effects of 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

* + - * + The theory of planned behavior ([Ajzen, 1991](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr6-10888683231178056)) is a promising foundation for distinguishing action characteristics. Researchers could investigate whether self-efficacy is more strongly related to behavior if efficacy actions are concrete (vs. abstract), located in the public sphere (vs. private sphere), single-time behaviors (vs. routines), and if action-aim contingencies are strong (vs. weak, [Bandura, 1997](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr28-10888683231178056), p. 134).
        + Thus, specific efficacy aims should be more or less associated with long-term collective action tendencies
        + The triple-A framework could also be used for reconsidering agents, actions, and aims to build and maintain a sense of self-efficacy in practical work for social and ecological causes. For example, if someone feels personally helpless, they can reconsider their current group memberships and look for agentic groups that help them regain self-efficacy ([Fritsche et al., 2018](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr126-10888683231178056)). When faced with collective action failure, activists might reconsider their aims so that they can maintain a sense of agency (e.g., “The action failed but we managed to build a network”; [Barr & Drury, 2009](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr37-10888683231178056)). Another option would be reconsidering their actions, and possibly choosing another type of collective action in the future (e.g., non-normative action when confronted with corruption; [Thomas & Louis, 2014](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr340-10888683231178056)). This way, the triple-A framework can also serve as a practical framework of (re)evaluating collective action from a psychological perspective.
* 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?

*In order to answer these questions, we resorted, as described above, to existing measuring instruments for the assessment of sustainably significant knowledge, attitudes, behavioral readiness, and subcompetencies to solve partial problems of sustainable development. Finally, items on such facets of sustainability competencies for which we could not find any operationalization in the literature were newly formulated. In the following section, the procedure of the construction of the test and novel data of the results from the first assessment period will be reported. In so doing, we will also investigate whether the test adequately meets important quality criteria of a quantitative measuring instrument. In the discussion of the results, we want to explore the opportunities and limits for the further development of ESD, arising from the use of appropriate assessment instruments.*

## 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