# Titles

FROM CHATGPT

"Empowering Change: Measuring Student Sustainability Competencies through the Triple-A Framework of Self-Efficacy Beliefs"

"Believing in Better: A Comprehensive Approach to Measuring Student Sustainability Competencies with Self-Efficacy Insights"

"Sustainable Futures: Integrating Self-Efficacy Beliefs into the Measurement of Student Competencies"

"Triple-A Framework for Self-Efficacy: Enhancing the Measurement of Student Sustainability Competencies"

"From Belief to Action: Validating Student Sustainability Competencies through Self-Efficacy Measures"

"Measuring What Matters: The Role of Self-Efficacy in Student Sustainability Competencies"

"Long-term Insights: Measuring Student Sustainability Competencies with a Focus on Self-Efficacy"

"Self-Efficacy and Sustainability: Developing and Validating Tools to Measure Student Competencies"

Measuring What Matters: Integrating Self-Efficacy Beliefs into the Measurement of Students‘ Sustainability Competencies

Measuring What Matters: Enhancing the Measurement of Students’ Sustainability Competencies by Integrating Self-Efficacy Beliefs

Measuring What Matters: Towards A Comprehensive Approach to Measuring Students‘ Sustainability Competencies by integrating Efficacy Beliefs

# Discussion

## RQ1

* Other factors that could play bigger role in SA and SB than ESD intervention
  + Already previous interest from self-chosen group 🡪 what would be goal of ESD intervention – quantity vs quality?
  + Social desirability (also at various time points?)
  + influence of media, FFF
    - Die Teilnahme an Fridays for Future war ein positiver Prädiktor sowohl für das Nachhaltigkeitswissen als auch für die Einstellungen und das Verhalten der Schüler\*innen. Außerschulische Lernumwelten (z. B. Freundeskreise, Familie, soziale Medien) haben im Jugendalter einen starken Einfluss, so dass die Wirksamkeit schulischer BNE beschränkt sein könnte.
  + BUGEN Attitude
    - Attitude: According to previous research, younger children also tend to have a higher environmental attitude than older children (Krettenauer, 2017; Leeming et  al., 1995; Liefländer et  al., 2013).
    - BUGEN: attitude went down
      * Die durchschnittliche Schulnote, die nachhaltigkeitsbezogenen Einstellungen zu Beginn des Schuljahres, die Teilnahme an Fridays for Future, die Kenntnis des Begriffs Nachhaltigkeit und die Jahrgangsstufe stellten jedoch weiter signifikante Prädikatoren auch der nachhaltigkeitsbezogenen Einstellungen dar. Die Schulformen standen dagegen in keinem statistisch bedeutsamen Zusammenhang mit der Entwicklung der nachhaltigkeitsbezogenen Einstellungen innerhalb eines Schuljahres.
  + BUGEN behaviour
    - Die durchschnittliche Schulnote, das von den Schüler/- innen zu Beginn des Schuljahres berichtete Nachhaltigkeitsverhalten und die Teilnahme an Fridays for Future stellten signifikante Prädiktoren dar.
  + Barriers from outside that led to frustration (could explain peak?)
    - Auseinandersetzung ohne SW-Erfahrung führt zu Abfall (Klima-Emotionen 🡪 importance whole-institution approach; Stellenwert BNE an Schule (Whole School Approach!)
  + Influence of teachers (REF WALTNER) 🡪 high environmental consciousness( importance BNE 🡪 less succesful (Reaktanz der SuS?)// Bereits in anderen Studien wurde nachgewiesen, dass ein pluralistischer Zugang, also die Diskussion vielfältiger Sichtweisen anstatt der Präsentation einer „richtigen“ Meinung im Kontext nachhaltiger Entwicklung, einen positiven Effekt auf das Verhalten der Lernenden hat (Boeve-de Pauw et al., 2015).
    - * Auf Lehrkräfteebene konnten das berichtete Umwelt- und Nachhaltigkeitsbewusstsein der Lehrkraft und die BNE-Fortbildungen – jedoch beide erwartungswidrig in negativer Richtung – als signifikante Prädiktoren für die nachhaltigkeitsbezogenen Einstellungen ermittelt warden
      * , lässt sich auch nur vermuten, dass es bei den Schüler/-innen bei zu pointierten Äußerungen bezüglich des eigenen Umwelt- und Nachhaltigkeitsbewusstsein seitens der Lehrkraft möglicherweise zu einer Reaktanz (d.h. einer Art innerer Widerstand) in der eigenen Einstellung kommen könnte.
    - Auf Lehrkräfteebene wurden der persönliche Stellenwert der BNE und die Anzahl von besuchten BNE-Fortbildungen als negative(!) signifikante Prädiktoren, die Selbstwirksamkeitseinstellungen in Bezug auf BNE jedoch als positiver signifikanter Prädikator für das selbstberichte nachhaltigkeitsbezogene Verhalten der Schüler/-innen ermittelt.
* Other determining factors of the study

Schulform? In der wissenschaftli-chen Literatur wird diese Verbindung zwischen BNE und Montessori bereits untersucht (vgl. Howaida Sayed, 2017; Lewis, 2012).

My findings highlight that

* + Importance design SC measurement (ESD research can benefit Using empirical, long-term data)
  + Importance design ESD intervention (to reach whom, with what impact, external conditions as well)

*Even though, 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)*].*

## RQ2

VALIDATION

on the other hand, our findings also provide support for the Campbell paradigm (see Kaiser et al., 2010) – in this paradigm, personal attitudes can be derived from verbal acts, such as expressions of appreciation for the environment and self-reports of past engagement in environmentally friendly behaviors (Kaiser et al., 2018). Our findings also show that it is not relevant with which specific items a latent attitude is assessed but that any number of reasonably well-phrased behavioral or verbal selfreports which are aimed at the attitude object in question can be used to infer the underlying. This supports the call for a higher priority of specific objectivity within the validation criteria for measurements in general (for a detailed account, see Kaiser et al., 2018).

### RQ2: Self-efficacy beliefs

**Why is measuring collective efficacy so interesting and relevant? How can it be increased? What are the links between individual and collective efficacy 🡪 implications for ESD design**

* **Implications for findings, and measurement and ESD design**

For discussion individual/ collective

* Focus on collective agents 🡪 inhowfar sucessfull here or not?
* TPB-based survey only on private sphere action
* Relation to ESD intervention has not been researched yet, but interesting to understand how collective efficacy could be increased (🡪 other term?)
* Importance of group size and group cohesion (not in intro yet!)

For discussion aim/action

* Feedback from environment and connection to difficulty of task
* If action focussed lower than more connected to actual behavioral costs, also going together with campbell paradigm (and steps to overcome knowledge/intention-behaviour gap) 🡪 could indicate actual constraints
* Makes sense that aim focussed higher, because probable desirability of aim higher. Making question methodological of relevancy proposed actions and/or barriers from outside
* Aim content not so relevant for control group – bridge to normative element and enabling people to work together no matter what normative goal?

Methodological: Need to check for desirability of aim, relevance group/actions asked in pilot test in future? Showing importance structural barriers + also to inform ESD design   
🡪 importance collective efficacy (as it also includes structural barriers)

Connection to my results

* Here: desirability of the aim not relevant for control group (considered because of framing of questions?), neither action
* Design not matching to collective efficacy (structural barriers) or not known in this context

* And desirability of aim?
  + - * Reese and Jung suggest that agent-action-aim better predictor for more concrete intentions, whether agent-aim of more general
      * Actions and aims should and can! 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
      * Similarly, the question arises whether these types of efficacy beliefs share the same relation to other constructs (predictors, outcomes, or moderators of relationships). We hypothesize that agent-action self-efficacy might be more connected to actual behavioural costs, socioeconomic circumstances, and impactful behaviour, whereas agent-aim self-efficacy might be more closely related to attitudes, goals, visions, and intentional behaviour (see [Bain et al., 2013](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr19-10888683231178056); [Bamberg & Rees, 2015](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr23-10888683231178056)). As perceived behavioural control in the theory of planned behaviour ([Ajzen, 1991](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr6-10888683231178056)) predicts intention but also moderates intention-outcome relations, we suspect that the same might be true for action-focused self-efficacy.
      * Action-focused self-efficacy is therefore likely to capture actual constraints such as time, money, or social resources that may prevent a person from following through on their intention. However, aim-focused self-efficacy is less related to these constraints and more involved in the formation of an intention. Thus, a key difference between action- and aim-focused self-efficacy may be that the former moderates intention-behavior relations while the latter does not. Connected to this, future research could also explore whether aim-focused self-efficacy is based on less rational thought and more emotional reaction than action-focused self-efficacy, which would explain why analytic interventions have been rather unsuccessful in manipulating it (see [Hornsey et al., 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056)).
      * + Campbell: Within the Campbell paradigm, a person’s attitude becomes transparent in the amount of behavioral cost said person is willing to overcome in order to pursue their goal (Byrka et al., 2017).
      * as research shows that collective efficacy highest, when medium task 🡪 maybe too difficult?  
        🡪 link to climate anxiety and structural barriers!

Climate anxiety

Supporting H4, the less satisfaction of their basic psychological needs for autonomy,

competence, and relatedness people experienced, the more climate anxiety they reported.

Our result is in line with the theoretical underpinnings of self-determination theory (Deci

& R.M. Ryan 2000) and replicates previous findings on need frustration and anxiety (Hal-

vari et al. 2019; S. Ryan & McGuire 2016), worry (Howell & Sweeny 2019), and depres-

siveness (Heissel et al. 2018).

NEEDS AND ASPIRATIONS

Self-determination theory (Deci & R.M. Ryan 2000; R.M. Ryan & Deci 2017) is a human-

istic, organismic-dialectical theory of human motivation. It proposes that the universal,

innate basic psychological needs for relatedness (belonging), competence (efficacy), and

autonomy (self-determination) have to be satisfied to experience mental health and well-

being and to cope with stressors and threat proactively. People whose basic psychologi-

cal needs are satisfied are more likely to act pro-environmentally (see Wullenkord (2020)

for an overview). Need frustration is, in contrast, associated with inner conflicts, reduced

human functioning, ill-being, and defensiveness (Benita et al. 2019; Heissel et al. 2018;

Hodgins et al. 2006; R.M. Ryan & Deci 2017; Vansteenkiste & R.M. Ryan 2013). For

example, first findings in the climate context suggest that basic psychological need frustra-

tion is associated with climate denial (Wullenkord 2019). Severe and ongoing need frus-

tration can lead to non-optimal human functioning and psychopathology (Deci & R.M.

Ryan 2000). 🡪 support found

* Inform ESD design: Limited empirical data available, but having more could have interesting practical implications
* Different results regarding predictive power of the links  
  🡪Finally, we believe that distinguishing efficacy is also relevant from a more practical perspective. Distinguishing links between agents, actions, and aims enables better predictions about which characteristics of self-efficacy make it more or less predictive of relevant social and environmental outcome variables. Such detailed knowledge is needed, for example, in campaign design, political decisions, and team building in groups working against social and ecological injustice. Then again, in our own practical work with environmental and social rights activists (e.g., in workshops, lectures, counseling), we noticed that it is not intuitive for practitioners to make the above-mentioned distinctions. Responding to this, researchers could use the triple-A framework to practically integrate self-efficacy links into one overarching framework that simultaneously allows for a more nuanced research overview when it comes to practical counseling and advice.

Is somewhat integrated barriers from the outside? Aim is more desirable of involved group, but actions do not seem promising

* Difficulty of task 🡪 changing sth for school as expert group, too difficult or maybe also decreased after nothing happened? 🡪 considering structural factors as well!
  + Policy implications. The trade-off between responses to more or less difficult tasks and perceived (collective) efficacy is informative for policy making as it shows that people may more easily engage in behaviours that cost little but feel more efficacious through performing somewhat more difficult behaviours.
  + 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" \l "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)).

Normative dimensions asking about self-efficacy beliefs, but also need for research on actual shifts in power (Findings highlight when/if differentiation is useful/ complementary as SC)

Normative dimension

Solutions to environmental problems are multifaceted; private-sphere proenvironmental behavior refers to the purchase, use, and disposal of personal and household products that have [environmental impacts](https://www.sciencedirect.com/topics/social-sciences/human-activities-effects), whereas public-sphere proenvironmental behavior refers to environmental citizenship as well as the support and acceptance of public policies ([Stern, 2000](https://www.sciencedirect.com/science/article/pii/S0272494415000237?via%3Dihub" \l "bib55)). Private actions are limited in addressing environmental problems unless combined in joint efforts for collective public change. According to [Bandura (1997)](https://www.sciencedirect.com/science/article/pii/S0272494415000237?via%3Dihub" \l "bib9), self-efficacy is strengthened when people master the specific skills required to engage in proenvironmental behavior and are verbally persuaded of their ability to perform such behavior. These sources of self-efficacy can be effective when people judge the effectiveness of proenvironmental behavior of their own groups. Therefore, if a group successfully masters a particular task and receives positive feedback about its proenvironmental performance, [group members](https://www.sciencedirect.com/topics/social-sciences/group-members) might be stronger in their belief that they can produce the desired results. A commitment to collective efforts is required to instill the belief in people that their actions can [influence](https://www.sciencedirect.com/topics/social-sciences/influencer) their surroundings; thus, people can become more willing to engage in proenvironmental behavior. (CHEN)

* Somewhat includes structural barriers
* Integrate self-efficacy research into SC research: linking the aim of BNE to self-efficacy framework (wanting collective action as outcome?)
* 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)
* Collective efficacy was better predictor of pro-evironmental behaviour than self-efficacy ((M-F Chen, 2015)
* While self-efficacy theory strongly focuses on the need for efficacy (competence), self-determination theory ascribes equal importance to all basic psychological needs (i.e., competence, autonomy, and relatedness), assumes that meeting these needs is intrinsically satisfying ([Elliot et al., 2001](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr109-10888683231178056)), and emphasizes the important role of autonomy for human agency ([Chirkov et al., 2011](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr73-10888683231178056)). Rather than looking at aim strength, self-determination theory distinguishes different qualities of motivation (e.g., [Ryan & Deci, 2017](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr282-10888683231178056)). Based on this, we define perceived agency as the belief that a self-categorized agent can perform a *self-determined* action toward an *autonomous* aim.
* Thereby, it raises the question of where actual agency for collective social and ecological aims is situated ([Louis, La Macchia, et al., 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr227-10888683231178056)). At this point, our reasoning reaches the boundaries of self-efficacy theory and the triple-A framework and enters the realm of actual (and not only perceived) agency that we believe [Bandura (1997)](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr28-10888683231178056) also wanted to call attention to. In terms of the triple-A framework, agency thus would not only include agent-action-aim *perceptions* but embrace actual agent-action-outcome *influences*.
* Implications
  + Methodological: Need to check for desirability of aim, relevance group/actions asked in pilot test in future? But also to inform ESD design
  + Is somewhat integrated barriers from the outside? Aim is more desirable of involved group, but actions do not seem promising
  + Normative dimensions asking about self-efficacy beliefs, but also need for research on actual shifts in power
    - Findings highlight when/if differentiation is useful/ complementary as SC?

🡪Match of potential goal of ESD and self-efficacy beliefs (normative, collective, aim-focussed)

AT THE MOMENT DISCUSSION BUT ALSO LEFT OUT

Self-efficacy beliefs as Sustainablity competencies can complement by adressing several critique of the TPB. Firstly, Self-efficacy goes beyond the internal focus and inherently incorporates the outside factors as well, with a higher self-efficacy only emerging, if the person believes that they can actually change something. Secondly, as Triple A does not necessarily ask for specific behaviours, but more on meta-level whether the agent thinks that they can achieve their self-chosen goal, it is a nice way around the instrumentalising vs emancipatory debate of ESD. Furthermore, corresponds to recommendation methods, *to promote changes in behaviour, 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 (RIESS),* meaning desirable outcome of education to make students feel like they can actually have an impact*.* This could also address the issue of reported negative climate emotions, where problems are brought up to students, but no way of responding to that, leading to negative emotions and demotivation (SEE REF??).

BASED ON WHAT? *Enhancing group identity and cohesion through activities that build a strong sense of belonging and shared purpose can significantly boost collective efficacy. Providing opportunities for groups to experience success in smaller, manageable tasks can build confidence in their collective capabilities. Effective leadership and clear, achievable goals also play a crucial role, as they help guide the group and provide direction. Ensuring that the group has access to necessary resources and support systems, including financial resources, information, and external support, can further enhance their collective efficacy. Additionally, offering constructive feedback and opportunities for reflection on past performances can help groups understand their strengths and areas for improvement.*

INTRO?

*However, for research on spillover effects (for a review, see [47]), it is helpful to know that task difficulty of a topic-specific challenge (as in our case, a plastic reduction task) can also increase general collective efficacy beliefs that might in turn enhance pro-environmental behaviour in other domains—a finding in line with [26], who show that self-efficacy beliefs mediate between less difficult and more difficult behaviours. Our findings nicely complement this research, suggesting that such spill-over can also be mediated via collective efficacy beliefs*

*DISCUSSION THIRD PARAGRAPH*

.Interesting, whether real lief outcomes for individuals and society (REF Kurz und Kubeck , 2021) .Adding to the not answerable question of goals of ESD, project-specific goals also play an important role of this ESD intervention. In the KRS project, democracy education is also explicitly stated, which on the one hand could also be considered within the ESD framework (and also a good example of ESD2 approach), but with the current approach focussing on sustainability friendly attitudes and behaviour is not really captured. I tried to address some of the criticism by incorporating the dimension of self-efficacy beliefs as an outcome indicator. With the new Triple A framework of self-efficacy beliefs, I tried to partly address those challenges, as the limited empirical research points towards better prediction of real-world behaviour. Furthermore, the addition of the indicator for collective efficacy seems relevant as an outcome indicator. Addressing part of the critique about non-instrumental ESD, not specific behavioural focussed outcomes (*While behavioural change is an important indicator, it should be complemented by other measures that capture the complexity of human motivations and the broader educational goals of fostering critical thinking, empowerment, and intrinsic motivation. This comprehensive approach ensures that interventions not only change behaviour but also cultivate the underlying values and beliefs necessary for sustained and meaningful engagement with sustainability issues.)*, and incorporating the aspects of deciding on desirability of aim by the agent itself. While the empirical findings regarding changes in sustainability competencies of my research are to be considered cautiously due to impaired data availability, I still believe that my research can add to the ongoing debates on finding suitable indicators for sustainability competencies by including self-efficacy beliefs of students.*While this research can add to a more comprehensive understanding of sustainability competences, their continuous development, as well as possibilities of measurement, the interpretation of the outcomes of this research needs to be treated with caution. The generalisability of the findings are heavily impaired by the lack of data availability.*

# Introduction

Include overview part?

*In order to answer these questions, we resorted, as described above, to existing measuring instruments for the assessment of sustainably significant attitudes, behavioral readiness, 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.*

**Topic and concluding sentences**

**Before: importance of measuring? Importance students, importance ESD**

Measuring sustainability competencies depend on the goals and objectives set out.   
🡪 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 given by the tripartite frame model.

Measuring sustainability competencies requires operationalisation of the aspects most relevant to the goals.   
🡪 When operationalising the SC most relevant to real-world behaviour, the dimensions of sustainability attitude and self-reported sustainability behaviour are the most relevant.

Measuring sustainability competencies can benefit from incorporating theories of behaviour.   
🡪 Therefore, sustainability competencies and the dimensions of climate attitude and climate behaviour can be operationalised with the components of the theory of planned behaviour.

Measuring sustainability competencies and their attribution to ESD interventions can be assessed using different methods.  
🡪 Assessing sustainability competencies and their relationship to ESD interventions benefits from looking at long-term empirical data.

Measuring sustainability competencies and their attribution to ESD interventions, depends on the type of intervention.  
🡪 Assessing sustainability competencies and their relationship to innovative ESD interventions benefits from a quantitative, quasi-experimental design.

Measuring sustainability competencies requires validity criteria to *ensure that the measurement instruments capture the achievement of the goals.  
🡪 Measuring sustainability competencies can be more robust, when validated by an additional scale, such as the self-efficacy belief scale.*

Measuring sustainability competencies could benefit from a higher differentiation and consideration of aspects.  
🡪 Sustainability competence measurement can benefit from an integration of self-efficacy beliefs.

Sustainability competencies are not only dependent on the individual.  
🡪 Sustainability competencies can benefit from looking at both individual and collective levels.

Changes in sustainability competencies, particularly self-efficacy beliefs, are dependent on feedback from the environment.  
🡪 Measuring sustainability competencies can benefit from analysing both action- and aim-focussed dimensions of self-efficacy beliefs.

Big framing? Idea for education, especially emancipatory approaches to sustainability to foster human agency

Participatory approach - leave out?

Emancipatory vs instrumental BNE?

**Big framing: actual Behavior/ real world change??**

**Big framing: Measurement of self-efficacy beliefs is important!**

## Topic sentences to lead upto RQs:

## General intro

* 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
* Input level: Polics level on intl, national, local levels: how succesful were those/ desired effect?
* 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
* General importance BNE and controvery
  + Def ESD on local level (see EWM p.2)
  + Output orientation: achievement of these goals? – competencies which enable the learners to contribute to real-world change
  + Measurement instrument, which has proven to be predictive of real-world behaviour impact
* SCs, their development, sustainability and educational governance through policy-making 🡪 appropriate evidence-based recommendations for development of ESD research and implementation of ESD in school practice
* 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
* Focus of article?

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.

### 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
* ESD with innovative methods?

### 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

## Theory part?

ROLE OF EDUCATION  
One general instrumental vs emancipatory here + own epistemoglocial view here?

Die BNE vermittelt nicht nur wünschenswerte Verhaltensweisen, sondern soll Schüler\*innen im Sinne einer emanzipatorischen BNE zu einer kritischen Auseinandersetzung mit der Komplexität, der Unsicherheit und den Widersprüchen in unserer Gesellschaft befähigen (Vare & Scott, 2007). Die dazu formulierten Ziele sind oft abstrakt und schwer in Messinstrumente überführbar (Gräsel et al., 2012).

Adopted by UNESCO, and echoing the Bologna Process that started in 1999 which allowed the standardization of a predominantly European university system based on common competences [50], the approach endorses an emancipatory vision of ESD, which Vare and Scott [51] and Wals [52] call “ESD 2”, to help build the capacity to think and act critically in tomorrow’s world (in opposition to what these same authors call “ESD1”, a more normative vision where ESD directly promotes certain modes of behavior instead of aiming to develop the capacity to act with autonomy of thought). The aim will be to be able to define the expected competences in order to see the pedagogical objectives of ESD become a reality: to enable students to become agents of change capable of dealing with systemic, ambiguous, uncertain, changing problems, and to become managers and leaders in the transition towards more SD and in all sectors.

The outstanding role of ESD for sustainable development is largely consensual. However, depending on the different understandings of the ESD concept [[**4**](https://www.mdpi.com/2071-1050/11/6/1717#B4-sustainability-11-01717),[**5**](https://www.mdpi.com/2071-1050/11/6/1717#B5-sustainability-11-01717),[**6**](https://www.mdpi.com/2071-1050/11/6/1717#B6-sustainability-11-01717)], there is also criticism of the term itself [[**7**](https://www.mdpi.com/2071-1050/11/6/1717#B7-sustainability-11-01717),[**8**](https://www.mdpi.com/2071-1050/11/6/1717#B8-sustainability-11-01717)]. In the framework of this article, it is unfortunately not possible to go into depth regarding the details and theory of these debates. To give an example, other transformative approaches or transformational concepts of education could be taken into account when dealing with ESD in a broader sense [[**5**](https://www.mdpi.com/2071-1050/11/6/1717#B5-sustainability-11-01717),[**9**](https://www.mdpi.com/2071-1050/11/6/1717#B9-sustainability-11-01717),[**10**](https://www.mdpi.com/2071-1050/11/6/1717#B10-sustainability-11-01717)]. The current state of the debate can be seen as follows: Although sustainable development and ESD are widely accepted as theoretical concepts or goal dimensions, they remain without a universally agreed upon definition [[**11**](https://www.mdpi.com/2071-1050/11/6/1717#B11-sustainability-11-01717),[**12**](https://www.mdpi.com/2071-1050/11/6/1717#B12-sustainability-11-01717)].

When it comes to education, both defining outcomes and measuring success are difficult as the process of education is complex and multifaceted (Ball 2008; Liddy 2014). Bourn (2014a) argues strongly that the learning outcomes from development education cannot be predefined; rather, individual learners engage in debates on development and global poverty in order to deepen their understanding of different perspectives and encourage critical reflection.

As noted earlier, the dominant form of assessment of impact from the educational intervention utilised quantitative measures, such as a pre/post survey or questionnaire, essentially reflecting a positivist epistemology. I am also using a positivist epistemology.

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?

* According to goals (behavioural, motivtional-affectional dimensions)
  + Need for goals and operationalisation! Recourse to exisintg disciplines
  + Goals should be structured and related to each other (Frame model from Riess)
  + Based on three dimensions (Rieckmann, Waltner)
    - Regional education plans or
    - International framework SDGs (Agenda 21), but no operationalisation ESD output, but normatively well founded
  + 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)]).
  + Behavioral dimension absent! (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
    - 🡪

Having clarified goals, we need to to be able to measure the desired outcomes. Desired outcomes can be tested using indicators. Indicators need to be validated.

LATER? Measuring sustainability competencies in their goal dimensions can be assessed through different methods, each with its own advantages and disadvantages (REF).

objectives and competencies in ESD that are or could be translated into measurement models and tools.

* 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
    - 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
* Methods for measuring goal dimensions:
  + Research exists for goals. But not for adequate measurement instruments
  + Operationalisatoin attempts availale from other research disciplines (+ exisint qualitative data)
  + Exising examples (and also using frame-model)
    - Knowledge covered in article
    - 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
    - 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)].
    - 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
    - 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)]).
  + 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

**TPB**

**MA Theories bahviour overview Pauli**

* Theories behaviour 🡪 complex question how (sustainable) behaviour emerges
* From within vs from-without 🡪 both?!; from-within more relevant for education?
* 3 explanation models: rational-choice, socio-psychological action models, environment-specific models
* (Bamberg & Möser, 2007, p. 16). According to this, problem awareness, internal attribution, social norm, sense of responsibility, perceived behavioural control, inner attitude, moral norm and intention are interrelated in order to explain environmentally conscious behaviour auf Grundlage TPB and NAM
* Bamberg und Möser nennen TPB und NAM als die Modelle, die am häufigsten zur Erklärung von umweltrelevanten Verhalten herange-zogen werden (Bamberg & Möser, 2007, S. 15), was durch eine Literaturstudie von Sopha zum Teil bestätigt wird.
* Definition Verhalten?
* TPB
  + eine der einflussreichsten Ansätze innerhalb des from-within-Lagers (Ertz et al., 2016, S. 3974).
  + Intention und die wahrgenommene Kontrolle über das Verhalten (Perceived Behavioral Control, PBC) als direkte Determinanten von Ver-halten angesehen (Ajzen, 1991, S. 184). Die Intention wird wiederum ebenfalls durch die PCB beeinflusst, aber auch durch zwei weitere Faktoren. Zum einen wirkt sich die Ein-stellung zum fraglichen Verhalten, zum anderen die subjektiven Normen auf die Verhal-tensintention aus (ebd., S. 188). Hinter diesen Determinanten stehen Glaubenssätze, be-ziehungsweise Überzeugungen, die sich auf Verhalten, Normen und Kontrolle beziehen (ebd., S. 189). Im Mittelpunkt steht dabei das Eigeninteresse der Person, die abwägt, wel-che Folgen die Handlung für sie haben wird (Kaiser et al., 2006, S. 2151).
* Vergleich Theorien
  + Moralisches vs rational choice
  + Beispielsweise haben Kaiser et al. die Erklärungskraft der TPB für umweltschützendes Verhalten getestet (2006, S. 2160). Dieser Studie nach zu urteilen erklären die drei „[…] Determinanten, Einstellung […], subjektive Normen […] und wahrgenommene Verhal-tenskontrolle […] 76% der Varianz der Verhaltensintention“ (ebd.), während diese wie-derum „[…] 95% der Varianz für das Umweltschutzverhalten einer Person“ erklärt (ebd.)
  + Das kann daran liegen, dass die TPB mit der PBC in gewissem Maße kontextuelle Fak-toren und vor allem Selbstwirksamkeitsüberzeugungen mit einbezieht (Fishbein & Ajzen, 2010, S. 18)
  + alle Beziehungen zwischen den einzelnen Determinanten klar bestimmt sind, bleiben die Wirkungsrichtungen zwischen Einstellun-gen, subjektiven Normen und wahrgenommener Verhaltenskontrolle bei der TPB lücken-haft identifiziert (Kaiser et al., 2006, S. 2165).
  + In Bezug auf die Überlegungen zum Klimabewusstsein, das kognitive, affektive und konative Aspekte umfasst, scheint die TPB am anschlussfähigsten. Die kognitive Dimen-sion wird in dieser Theorie nur am Rande über die dritte Kausalebene einbezogen, jedoch kommt diese auch in den anderen beiden vorgestellten Theorien nicht vor. Einstellungen und subjektive Normen lassen sich hingegen gut der affektiven Dimension zuordnen, während die wahrgenommene Verhaltenskontrolle und die Intentionen konative Aspekte darstellen (Weber, 2008, S. 116).
* Kritische Betrachtung
  + Die Theory of Planned Behavior bietet eine gute Erklärungsgrundlage für Verhalten im Allgemeinen und umweltschützendes Verhalten im Speziellen
  + Bamberg et al. kritisieren, dass sich der Blick dieser psychologischen Modelle zu sehr nach innen richtet und interne Faktoren wie Wissen und Einstellungen dadurch übermäßig beachtet werden (2021, S. 2). Dagegen finden sich die strukturellen Barrieren, Machtverhältnisse und Ungleichheiten in vielen Theorien nicht wieder (ebd.). Die Auto-ren geben zu bedenken, dass dies eine Verantwortungszuschreibung für eine nachhaltige Entwicklung an die relativ machtlosen Individuen in der Gesellschaft impliziert, während die systemischen Faktoren vernachlässigt werden (ebd.).
  + Kaiser et al. äußern die Kritik an der TPB, dass moralische Überlegungen in ihr zu kurz kommen (2006, S. 2152). Da es sich bei Nachhaltigkeit um eine moralische Frage han-delt, bei der die eigenen Interessen gegen die der Allgemeinheit abgewogen werden, soll-ten laut den Autor\*innen auch moralische Normen Einzug in die TPB finden (ebd.). Als jedoch versucht wurde, die TPB durch die Einbeziehung von moralischen Normen zu erweitern, waren die Ergebnisse widersprüchlich und zeigten keine signifikante Verbes-serung der Erklärungskraft (ebd., S. 2152–2153).
  + Ein letzter großer Kritikpunkt ist, dass obwohl die TPB zu den besten Theorien zählt, um umweltfreundliches Verhalten vorherzusagen, die durchschnittliche Vorhersagekraft in unterschiedlichen Studien unterschiedlich bewertet wird. In einzelnen Studien können rund 95% der Varianz im Verhalten durch die Intention aufgeklärt werden (Kaiser et al., 2006, S. 2160). Jedoch liegt dieser Schnitt in einer Meta Analyse von Armitage und Con-ner mit 27% Varianzaufklärung deutlich tiefer (Armitage & Conner, 2001, S. 471).
  + Die Theory of Planned Behavior, die Verhalten über die Erfassung von vier Variablen vorhersagt, wird zur Operationalisierung hinzugezogen. Die vier Variablen auf der ersten und zweiten Kausalebene werden hier zusammenfassend als Klimabewusstsein bezeichnet.

### Appropriate methods operationalisation

🡪 importance empirical data, also especially of innovative methods

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). Methodologically quantitative research projects can make a very important contribution to the normative debate, through empirical insights.

Studies on ESD implementation processes might help to further illuminate the interconnections between seemingly different realities of policymakers and “the street ministers of education” (i.e., the teachers). In terms of Lipsky and other bottom-up theorists, they are also policy-makers “on the ground” as they are the very important stakeholders who implement the policies, i.e., in the classrooms (Lipsky, 2010; Waltner et  al., 2020). In this way, the actors (in the sense of the bottom-up approach, also including teachers and students themselves or any ESD learners) can initiate desired developments in a more empirically based and targeted manner and do not only have to refer to plausible and normative considerations and assumptions. Decisions can therefore be taken based on empirical long-term data and do not only need to be based on intuitively based perceptions or observations which the teachers make in the classroom.  
  
  
🡪 attribution to intervention (through control group)// quasi-experimental design  
  
🡪 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
* 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.

Comparision of design/ form of intervention (involvement of students), compared to research that just looks at development through a year

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However, many of these recommendations for certain learning and teaching methods and procedures are not supported by empirical evidence but instead by merely plausible arguments or references to individual case studies.

With regard to our first research question, we found that numerous authors expressed the conviction that ESD needs new, modern, alternative, and innovative procedures and methods—some even speak of a new learning culture or pedagogy—to achieve its goals [[**16**](https://www.mdpi.com/2071-1050/14/7/3708#B16-sustainability-14-03708),[**17**](https://www.mdpi.com/2071-1050/14/7/3708#B17-sustainability-14-03708),[**20**](https://www.mdpi.com/2071-1050/14/7/3708#B20-sustainability-14-03708),[**23**](https://www.mdpi.com/2071-1050/14/7/3708#B23-sustainability-14-03708),[**26**](https://www.mdpi.com/2071-1050/14/7/3708#B26-sustainability-14-03708),[**27**](https://www.mdpi.com/2071-1050/14/7/3708#B27-sustainability-14-03708),[**28**](https://www.mdpi.com/2071-1050/14/7/3708#B28-sustainability-14-03708),[**30**](https://www.mdpi.com/2071-1050/14/7/3708#B30-sustainability-14-03708)].

o promote ESD goals, the corresponding articles predominantly proposed methods that should enable self-regulated and self-directed learning of applicable knowledge and problem-solving skills and a new learning culture or pedagogy oriented towards the constructivist learning paradigm. A smaller group, in contrast, also recommended methods that follow a more cognitivist view of learning and emphasized a higher necessary degree of guidance by the teachers

The first group recommending methods with a high degree of self-direction cited the results of studies in the form of self-reports and self-assessments by participants in seminars and model projects (students, teachers) and expert surveys as evidence of the effectiveness of the methods they propose. 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)]. From a research-methodological and scientific-theoretical perspective, all of these types of studies are of an exploratory (investigative) nature [[**36**](https://www.mdpi.com/2071-1050/14/7/3708#B36-sustainability-14-03708)]. Such studies are informative when exploring new scientific areas and creating theoretical or conceptual preconditions for initial hypothesis formulations. However, they are not suitable for testing an assumed effectiveness of means and methods.

In the second group, which recommends methods with a high degree of guidance by the teacher, evidence for the effectiveness of methods and procedures is provided by references to hypothesis-testing, quasi-experimental studies [[**2**](https://www.mdpi.com/2071-1050/14/7/3708#B2-sustainability-14-03708),[**15**](https://www.mdpi.com/2071-1050/14/7/3708#B15-sustainability-14-03708),[**18**](https://www.mdpi.com/2071-1050/14/7/3708#B18-sustainability-14-03708),[**19**](https://www.mdpi.com/2071-1050/14/7/3708#B19-sustainability-14-03708),[**22**](https://www.mdpi.com/2071-1050/14/7/3708#B22-sustainability-14-03708)]. 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. Experimental studies in which people are randomly assigned to conditions would be even more reliable, allowing conclusions to be drawn about causal relationships. Experimental studies, however, are difficult to realize in educational contexts because they investigate natural groups nested in classes [[**37**](https://www.mdpi.com/2071-1050/14/7/3708#B37-sustainability-14-03708)]. 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)].

In conclusion, the literature lacks high-quality effectiveness studies, which should especially provide teachers in schools and universities with the secure knowledge of effective means for promoting ESD goals.

*Methods and Procedures for Promoting Motivation and Attitudes*

To promote personal characteristics with high affective–motivational components (e.g., attitudes toward sustainable development, acceptance and adoption of the maxim of inter- and intragenerational justice, willingness to participate, and empathy), only “relatively effective” means are possible. That is, only under certain circumstances, the means are more likely to promote the desired characteristics [[**4**](https://www.mdpi.com/2071-1050/14/7/3708#B4-sustainability-14-03708)]. The reason for this uncertainty lies in the complexity of the human personality, which eludes all-too-simple influencing of central personality traits. Inducing cognitive conflicts, stimulating perspective taking, confronting the learner with divergent arguments, and enabling the experience of competence and autonomy have proven to be helpful [[**41**](https://www.mdpi.com/2071-1050/14/7/3708#B41-sustainability-14-03708),[**45**](https://www.mdpi.com/2071-1050/14/7/3708#B45-sustainability-14-03708)]. Potentially suitable methods that can facilitate the promotion of motivation and attitudes include 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.

Einstellungen gelten grundsätzlich als sehr stabil und nicht leicht veränderbar. Allerdings können aus der allgemeinen Motivations- und Sozialpsychologie Prinzipien abgeleitet werden, die auch für die BNE fruchtbar sein dürften. Ausgehend von Piagets Entwicklungstheorie können aus der Konfrontation mit anderen, von der eigenen Position abweichenden Einstellungen und Werthaltungen „kognitive Konflikte“ entstehen (Mischo, 2004). Es hat sich empirisch gezeigt, dass in diesem Falle die Diskussion in Kleingruppen zu einem höheren Niveau der Perspektivenübernahme führen kann, die auch für eine nachhaltige Entwicklung zentral ist (Mischo, 2004). Zudem kann eine Einstellungsänderung auch durch eine vertiefte Verarbeitung von Argumenten in einem „zentralen“ kognitiven Verarbeitungsprozess erfolgen. Dies kann erreicht werden, wenn die Relevanz der Argumente hoch ist, keine Ablenkungen vorliegen und die Argumente nicht zu häufig wiederholt werden (denn dieses führt zur Reaktanz).

Nach Deci und Ryan (2008) sind Grundbedürfnisse nach Kompetenzerleben, Autonomie und sozialer Eingebundenheit von zentraler Bedeutung. Allgemein kann die Motivation gefördert werden, wenn Schüler/innen sich in Fragen einer nachhaltigen Entwicklung als kompetent erleben, eigene Wahlmöglichkeiten haben (z. B. in der Schulmensa zwischen regional-saisonal produzierten Biolebensmittel und konventionell produzierten Lebensmittel wählen können) und gemeinsames Lernen in der Gruppe erleben (soziale Eingebundenheit). Besonders wünschenswert ist die Entwicklung intrinsischer Motivation, bei der das Gefühl der Autonomie erlebt und die Verhaltensregulierung persönlich als wichtig und wertvoll erachtet wird. Dabei werden die Tätigkeiten selbst als positiv und vollständig selbstbestimmt erlebt und die Verhaltensziele − in unserem Fall nachhaltiges Handeln − vollständig in das eigene Selbstbild und Selbstgefühl integriert (Deci & Ryan 2008)

*Methods and Procedures for Promoting Behavioral Readiness*

First, a brief preliminary remark: 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)].

Für diesen Zweck können Methoden und Verfahren aus der Willenspsychologie (Volitionspsychologie) empfohlen werden (bspw. Bewusstmachung und Problematisierung der handlungsleitenden eigenen Vorstellungen und Annahmen (Subjektiven Theorien) die Bildung konkreter Handlungsvorsätze, Anregung zur Selbstverpflichtung, Visualisierung von Handlungsergebnissen, Einsatz von Remindern (z.B. Rieß, 2010).

Thus, no responsibility would be assumed, and the trip would be justified. 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. Teachers can achieve this change, for example, by supporting the formation of concrete action resolution, stimulating self-commitment, visualizing action results, and using reminders [[**2**](https://www.mdpi.com/2071-1050/14/7/3708#B2-sustainability-14-03708)].

However, methods characterized by a high degree of guidance by the teacher (e.g., traditional teaching–learning formats such as lectures, direct instruction, and teacher-centered classroom discussion) have been widely shown to achieve a high level of cognitive activation if designed and implemented thoughtfully [[**49**](https://www.mdpi.com/2071-1050/14/7/3708#B49-sustainability-14-03708)]. In contrast, methods considered “active” (e.g., group work, learning with computer simulations) might fail to cognitively activate the learners if designed poorly. Thus, there is no “one” method for stimulating learning processes; rather, the effectiveness of a method depends on its design and implementation.

Against this background, a high demand currently exists for empirical effectiveness studies that focus on teaching and learning in the field of ESD, and more specifically, evidence-based recommendations of how ESD goals can be effectively promoted are urgently needed. The formulation of apparently plausible and modern-sounding recommendations for methods is not a sufficient substitute for this need.

RIESS (wirksam unterrichtet warden)

Befunde und Empfehlungen zu wirksamen Mitteln für die Förderung von BNE-Zielen

Wie wird nun in beiden Gruppen die Mittelempfehlung begründet? Anders ausgedrückt: welche Belege für eine Wirksamkeit der empfohlenen Mittel werden in beiden Gruppen vorgebracht? Allzu häufig − insbesondere in der ersten Gruppe − wird mit Plausibilitäten argumentiert, auf Selbstauskünfte und -einschätzungen von Lernenden („das fand ich interessant, da habe ich viel gelernt“) oder auf andere Autoren verwiesen, welche selbst wiederum auf der Basis von Vermutungen und Überlegungen eine Empfehlung aussprechen. In der zweiten und deutlich kleineren Gruppe finden sich hingegen eher Belege, die auf Ergebnisse aus forschungsmethodisch stärker kontrollierten Untersuchungen (z.B. so genannte quasi-experimentelle Studien) verweisen. Diese erlauben folglich eher empirisch, d.h. erfahrungswissenschaftlich begründete Rückschlüsse. Entsprechende Belege gelten daher als deutlich belastbarer. Noch zuverlässiger wären jedoch Empfehlungen, die auf so genannten experimentellen Untersuchungen beruhen, in denen Schüler/innen zufällig auf verschiedene Lernbedingungen zugewiesen werden, weil diese Studien eine (durch den Zufall erreichte) Kontrolle von solchen Störvariablen erlauben, die Ergebnisse beeinflussen könnten. Diese Art von Studien erlauben dadurch einen sicheren Schluss auf die verwendeten pädagogisch-didaktischen Mittel und Methoden als Ursache für die erfassten Lernergebnisse. Entsprechende Experimente ­können freilich im Kontext der Schule nur schwer realisiert werden.

* Measuring relevance
  + Bottom-up approach thorugh students and teachers and their decision of what is relevant – backing up through empirical data
  + Interdisciplinary SC

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

### Using self-efficacy as indicator for validation for real world behaviour change

Which of these in discussion?

SELF-EFFICACY AS INDICATOR LINKS

VALIDITY

4.2. Validity of the Measurement Tool

Another measure for determining the quality of an instrument is validity. Validity is understood in our case as the extent to which a measuring instrument is well founded and likely to correspond accurately to the real world based on probability, i.e., it measures accurately what it is supposed to measure. Different forms of validity exist [[**97**](https://www.mdpi.com/2071-1050/11/6/1717#B97-sustainability-11-01717)]:

Convergent validity is the degree to which the scale is related to other instruments that are designed to measure similar attitudes [[**98**](https://www.mdpi.com/2071-1050/11/6/1717#B98-sustainability-11-01717)]. Since no comparable measures exist that capture the presented dimensions of sustainability competencies, it is difficult to fully determine the convergent validity of the new scale.

Content validity refers to the extent to which the measure represents all facets of the sustainability competencies. As we carefully inspected theoretical literature and educational curricula with regard to sustainability competencies in order to construct the items, this validity criterion may be satisfied. In addition, we asked teachers to revise our instrument for the content and competencies of the curriculum. As described above, additional experts were involved in the evaluation of the measurement instrument.

External validity refers to the relationships between the test scores and other measurements. These relationships should be theoretically and empirically sound. Although previous research primarily focused on environmental knowledge, beliefs, and behavior, the following relationships regarding sustainability related competencies can be expected:

* 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)
  + The main message which we want to draw from this insight is that indicators which are designed to assess the outcome of ESD have to be validated as to their congruence with real-life outcomes in the context of a shift to a more sustainable society or decisions;
  + Underlying: behaviour outcome can and should be goal of ESD??!

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).

* + Validation (through connection to established indicators)
    - 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??

#### Link self-efficacy and actual behaviour

Include def here?

* Validation through Predictive power for behaviour/ behavioural intentions:
  + 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" \l "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.
  + 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" \l "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)).

* 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 🡪 compared to TPB, also considers outside factors in some way
    - 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!)

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.

* Self-efficacy beliefs
  + 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
      * Almost no empirical data on links + personal/ collective
      * One study reporting very high correlations between efficacy links on both levels (CHECK REESE AND JUNGE)
      * 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" \l "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

### Collective vs individual self-efficacy

FROM CHAT GPT OLD

Sustainability competences are not only dependent on the individual. In 1997, Albert Bandura already described a collective sense of powerlessness in an increasingly interdependent world and claimed that there is a growing need for not just individual but also collective agents in the face of multiple crises. Many people do not act together against climate change or social inequalities because they feel they or their group cannot make a difference. Understanding how people come to feel that they can achieve something (a perception of self-efficacy) is therefore crucial for motivating people to act together for a better world. The nature of the ecological and social crisis also demands collective action. Although the pathways and interlinkages between individual and collective self-efficacy beliefs are not yet fully understood, research can contribute to practical interventions based on this differentiation. For example, studies could test whether the path from collective to individual self-efficacy to private behavior, as proposed by Jugert et al. (2016), is causally replicable. Correlational studies have found individual self-efficacy to predict private behaviors and collective efficacy to predict activist behavior (Hamann & Reese, 2020; Morton et al., 2011), while experimental studies suggest that ingroup efficacy interventions outperform personal self-efficacy interventions in influencing actions (Jugert et al., 2016). Additionally, self-projection might cause personal self-efficacy and ingroup efficacy scales to overlap strongly. Research could focus on which ingroup efficacy agents are more or less important in specific social and ecological crises, informed by social identity theory (Tajfel, 1978), which characterizes various ingroup efficacy agents. For example, collective efficacy beliefs were more strongly connected to environmentally sustainable travel choices than self-efficacy beliefs (Homburg & Stolberg, 2006). These authors also showed environmental collective efficacy beliefs to be a stronger predictor of people's willingness to pay for environmental protection than self-efficacy and attitudes. Morton and colleagues assessed collective efficacy as an individual’s perception of their group's efficacy in mitigating climate change, finding it a significant predictor of private-sphere environmental actions (Morton et al., 2011). Given that collective efficacy was found to be a better predictor of pro-environmental behavior than self-efficacy (M-F Chen, 2015), incorporating collective self-efficacy beliefs as an outcome indicator in measuring sustainability competencies could be highly beneficial. Understanding these dynamics is essential for designing effective campaigns, making informed political decisions, and building cohesive teams working against social and ecological injustice. This comprehensive understanding of individual and collective self-efficacy beliefs, supported by the Triple-A framework, can provide nuanced research insights and practical advice, enhancing the impact of ESD interventions and promoting sustainable behaviors at both individual and collective levels.

OLD

Sustainability competences and their differentiation in individual and collective self-efficacy beliefs can have various advantages. *In 1997, Albert Bandura already described a collective sense of powerlessness in an increasingly interdependent world and claimed that there is a growing need for not just individual but also collective agents in the face of multiple crises (p. 520). Many people do not act together against climate change or social inequalities because they feel they or their group cannot make a difference. Understanding how people come to feel that they can achieve something (a perception of self-efficacy) is therefore crucial for motivating people to act together for a better world.* The nature of the ecological and social crisis also demand for collective action. Although the pathways and interlinkages between individual and collective self-efficacy beliefs are not understood yet, research can contribute to also inform practical interventions based on the differentiation. *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" \l "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)*).* (HERE OR DISCUSSION) *Correlational studies so far have found individual self-efficacy to predict private behaviours and collective efficacy to predict activist behavior (*[*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" \l "bibr183-10888683231178056)). 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*. *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.*All to inform ESD interventions also based with this theoretical and practical knowledge *(GIVE EXAMPLES 🡪 also in text?! Such detailed knowledge is needed, for example, in campaign design, political decisions, and team building in groups working against social and ecological injustice. Then again, in our own practical work with environmental and social rights activists (e.g., in workshops, lectures, counseling), we noticed that it is not intuitive for practitioners to make the above-mentioned distinctions. Responding to this, researchers could use the triple-A framework to practically integrate self-efficacy links into one overarching framework that simultaneously allows for a more nuanced research overview when it comes to practical counseling and advice.). 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.* Collective efficacy was better predictor of pro-evironmental behaviour than self-efficacy ((M-F Chen, 2015). Measuring Sustainability competencies could benefit from incorporating collective self-efficacy beliefs as an outcome indicator.

Advantages of differentiating them? Use criticism TPB also here?  
🡪 ecological and social crisis also demand for collective action (SW private behavior, CS activism)  
🡪 different predictors of behaviour and attitudes depending on self vs colllective  
🡪 understanding pathwass of behaviour can inform practical interventions  
🡪 research could focus on which ingroup efficacy agents are more or less important in specific social and ecological crises. Social identity theory (Tajfel, 1978) 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. 🡪 also to inform intervention design

* 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)
* 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" \l "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" \l "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.

Almost no empirical data on links + personal/ collective

One study reporting very high correlations between efficacy links on both levels (CHECK REESE AND JUNGE)

### Aim vs action

OLD

Changes in sustainability competencies, namely self-efficacy beliefs, are dependent on feedback from the environment.

and their differentiation in action- and aim-focussed self-efficacy beliefs can have various advantages. The triple A framework allows for a distinction between action and aim focussed self-efficacy links. *agent-action self-efficacy might be more connected to actual behavioral costs, socioeconomic circumstances, and impactful behavior, whereas agent-aim self-efficacy might be more closely related to attitudes, goals, visions, and intentional behavior (see*[*Bain et al., 2013*](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr19-10888683231178056)*;*[*Bamberg & Rees, 2015*](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr23-10888683231178056)*). As perceived behavioral control in the theory of planned behavior (*[*Ajzen, 1991*](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr6-10888683231178056)*) predicts intention but also moderates intention-outcome relations, we suspect that the same might be true for action-focused self-efficacy. Action-focused self-efficacy is therefore likely to capture actual constraints such as time, money, or social resources that may prevent a person from following through on their intention. However, aim-focused self-efficacy is less related to these constraints and more involved in the formation of an intention. Thus, a key difference between action- and aim-focused self-efficacy may be that the former moderates intention-behavior relations while the latter does not. Connected to this, future research could also explore whether aim-focused self-efficacy is based on less rational thought and more emotional reaction than action-focused self-efficacy, which would explain why analytic interventions have been rather unsuccessful in manipulating it (see*[*Hornsey et al., 2021*](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056)*).*

*The triple A framework includes aim-focussed self-efficacy as 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" \l "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)*).Many actions could (or not) lead to one aim. Disctincion aim-focused and action focused self-efficacy.* Looser action-aim continegencies (abundance of acitons relevantfor crisis) 🡪 don’t have to restrict to specific set of actions

*laying ground for categorising aim content. 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" \l "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)*).*

Measuring sustainability changes on aim- and action-focussed level allows for greater understanding of influence of outside and structural factors.

* In the end for practical perspective
* So far: lack of empirical data (see limitations paragraph in discussion)
* 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
* Includes intentional actions and desirbale aims: laying ground for categorising aim content
  + 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" \l "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.

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

* Integration
  + 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" \l "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.
* 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" \l "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
* **Dinstinguishing links between the As**
* Similarly, the question arises whether these types of efficacy beliefs share the same relation to other constructs (predictors, outcomes, or moderators of relationships). We hypothesize that agent-action self-efficacy might be more connected to actual behavioral costs, socioeconomic circumstances, and impactful behavior, whereas agent-aim self-efficacy might be more closely related to attitudes, goals, visions, and intentional behavior (see [Bain et al., 2013](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr19-10888683231178056); [Bamberg & Rees, 2015](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr23-10888683231178056)). As perceived behavioral control in the theory of planned behavior ([Ajzen, 1991](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr6-10888683231178056)) predicts intention but also moderates intention-outcome relations, we suspect that the same might be true for action-focused self-efficacy. Action-focused self-efficacy is therefore likely to capture actual constraints such as time, money, or social resources that may prevent a person from following through on their intention. However, aim-focused self-efficacy is less related to these constraints and more involved in the formation of an intention. Thus, a key difference between action- and aim-focused self-efficacy may be that the former moderates intention-behavior relations while the latter does not. Connected to this, future research could also explore whether aim-focused self-efficacy is based on less rational thought and more emotional reaction than action-focused self-efficacy, which would explain why analytic interventions have been rather unsuccessful in manipulating it (see [Hornsey et al., 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056)).
* Finally, we believe that distinguishing efficacy is also relevant from a more practical perspective. Distinguishing links between agents, actions, and aims enables better predictions about which characteristics of self-efficacy make it more or less predictive of relevant social and environmental outcome variables. Such detailed knowledge is needed, for example, in campaign design, political decisions, and team building in groups working against social and ecological injustice. Then again, in our own practical work with environmental and social rights activists (e.g., in workshops, lectures, counseling), we noticed that it is not intuitive for practitioners to make the above-mentioned distinctions. Responding to this, researchers could use the triple-A framework to practically integrate self-efficacy links into one overarching framework that simultaneously allows for a more nuanced research overview when it comes to practical counseling and advice.

OTHER ASPECTS SELF-EFFICACY

* + - * 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

* + - Limitations
      * Furthermore, we propose the distinction of three efficacy links (agent-action, agent-aim, agent-action-aim) based on operationalizations and labeling decisions. However, strong empirical evidence for such a distinction and possible moderators of the relation between various efficacy links is still missing. It remains a task for future research to investigate how interdependent these facets of self-efficacy actually are under which circumstances. Therefore, the triple-A framework should be understood as a theoretical proposition that conceptually fleshes out what is already practiced, highlights previously overlooked research questions, and helps researchers make more strategic decisions in the study of efficacy beliefs.
      * Constraints to generality
* Actions and aims (less relevant?)
  + 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.
  + While self-efficacy theory strongly focuses on the need for efficacy (competence), self-determination theory ascribes equal importance to all basic psychological needs (i.e., competence, autonomy, and relatedness), assumes that meeting these needs is intrinsically satisfying ([Elliot et al., 2001](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr109-10888683231178056)), and emphasizes the important role of autonomy for human agency ([Chirkov et al., 2011](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr73-10888683231178056)). Rather than looking at aim strength, self-determination theory distinguishes different qualities of motivation (e.g., [Ryan & Deci, 2017](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr282-10888683231178056)). Based on this, we define perceived agency as the belief that a self-categorized agent can perform a *self-determined* action toward an *autonomous* aim.
  + Thereby, it raises the question of where actual agency for collective social and ecological aims is situated ([Louis, La Macchia, et al., 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr227-10888683231178056)). At this point, our reasoning reaches the boundaries of self-efficacy theory and the triple-A framework and enters the realm of actual (and not only perceived) agency that we believe [Bandura (1997)](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr28-10888683231178056) also wanted to call attention to. In terms of the triple-A framework, agency thus would not only include agent-action-aim *perceptions* but embrace actual agent-action-outcome *influences*.
* RQ part here
* Overview over following thesis:
  + 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.

Important empirical data

* Self-efficacy data?

**Pauli**

Die statistischen Auswertungen lieferten Antworten auf die Teilfragen der übergeordne-ten Forschungsfrage, inwiefern sich der Grad der Teilnahme am KRS-Projekt auf das Klimabewusstsein und -handeln der SuS auswirkt. Die Zusammenhangsmaße Spearmans Rho und Eta-Quadrat zeigen zum zweiten Messzeitpunkt überwiegend positive Korrela-tionen mit mittleren Effektstärken zwischen dem Grad der Teilnahme und den Skalen-werten. Das bedeutet, je mehr die Person an der KRS beteiligt war, desto größer ist ihr Klimabewusstsein bei der Nachher-Befragung. Da zum ersten Messzeitpunkt weniger signifikante Werte und geringere Effektstärken vorlagen, gilt eine positive Wirkung des BNE-Projekts gilt als gesichert. Die Mittelwertvergleiche zeigen, dass vor allem die in-volvierte KRS-Schulgruppe von der Teilnahme profitieren konnte.

**Development and Validation of an Instrument for Measuring Student Sustainability Competencies**

Recalling the research questions of the study, we can state that a tool for measuring sustainability competencies (applicable for students in secondary schools in Baden-Wuerttemberg) could be developed and tested using four subdimensions of sustainability competencies: *Sustainability related knowledge* (I), *Affective-motivational beliefs towards sustainability* (II), *Sustainability-related behavior* (III), and *Intentional sustainability knowledge applied* (IV). When constructing an instrument to measure sustainability competencies, social desirability can be a pitfall making it difficult to state whether the given indications correspond to the actual sustainability related convictions or behaviors. Being aware of these pitfalls, we conscientiously formulated the items accordingly to avoid social desirability as much as possible. Nevertheless, difficulties of high discrepancies between the self-reported convictions, affective-motivational beliefs and behavior related to sustainability and the actual behavior remain. 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)]. Further implications for future research and an outlook will be given in the concluding section of this article.

Over and above that, other important stakeholders of ESD in schools, such as the teachers, the principals, or variables such as, for example, institutional aspects in the sense of the whole institution approach, should be taken into account as well. The question of if and how a policy has been successfully implemented on the international, nationwide, or local level is an essential domain of (political) science. Neglecting the critical success questions involved in implementing a policy means that the lacks and weaknesses of the implementation process go unnoticed. This is equally true in the field of ESD. On a policy level, the development of further indicators (see for example [[**114**](https://www.mdpi.com/2071-1050/11/6/1717#B114-sustainability-11-01717),[**115**](https://www.mdpi.com/2071-1050/11/6/1717#B115-sustainability-11-01717)]), or the evaluation of ESD programs (see for example [[**13**](https://www.mdpi.com/2071-1050/11/6/1717#B13-sustainability-11-01717),[**116**](https://www.mdpi.com/2071-1050/11/6/1717#B116-sustainability-11-01717)]), seem like helpful supplements to foster future steps and crucial insights in the implementation process of programs that aim to promote learner competencies to build a sustainable future.

**BUGEN**

* Zu beiden Messzeitpunkten ließen sich zunächst die folgenden Tendenzen feststellen: Mit steigender Klassenstufe steigt über beide Messzeitpunkte hinweg auch das Nachhaltigkeitswissen statistisch bedeutsam (p < .001). A
* Im Gegensatz dazu konnte jedoch für die Skalen nachhaltigkeitsbezogene Einstellungen und selbstberichtetes nachhaltigkeitsbezogenes Verhalten festgestellt werden, dass die Schüler/-innen mit ansteigender Klassenstufe geringere Werte bei den nachhaltigkeitsbezogenen Einstellungen (p < 0.01). und selbstberichteten nachhaltigkeitsbezogenen Verhaltensskalen (z.B. für die Skala Nachhaltigkeitsverhalten p
* Auch die beiden klassenstufenspezifischen Auswertungen für die Skala IV nachhaltigkeitsbezogenen Problemlösen und Verhaltensintentionen zeugen von einer statistisch bedeutsamen Zunahme in der kognitiven Dimension der Nachhaltigkeitskompetenz im Verlauf des Schuljahres der Klassen 5 und 6 (F(1, 648) =21.75, p < .001).
* Zusammenfassend kann daher konstatiert werden, dass die kognitive Dimension für alle Schulformen statistisch bedeutsam zunahmen (s. Abbildungen 4, 8, und 9), während die affektive Dimension während eines Schuljahres leicht zurückging, das selbstberichtete Verhalten dagegen eher konstant blieb. Diesbezüglich gilt es noch tiefergehende Gruppenanalysen anzustellen, um aufzuklären für welche Gruppen innerhalb des großen Samples diese rückläufigen Trends zutreffen. Jedoch entspricht die festgestellte Entwicklung der Nachhaltigkeitskompetenzfacetten (der Anstieg des Wissens und der Abfall der Gelingensbedingungen für die Entwicklung von Nachhaltigkeitskompetenz 23 Einstellungen/Verhaltensintentionen mit höheren Klassenstufen) internationalen und nationalen Befunden aus vergleichbaren Studien (Grund & Brock, 2018; Krettenauer, 2017; Liefländer et al., 2013). Sie werfen jedoch auch die Frage auf, welche Dimensionen der NK verstärkt im Schulunterricht fokussiert oder priorisiert werden sollten.

Link Sustainability competences and self-efficacy

From deepl

Empirical studies, particularly in the realm of environmental psychology, support this paradigm. Research has shown that environmental attitudes are predictive of corresponding behaviors like recycling or energy saving when the costs associated with these behaviors are considered. This highlights the practical applications of Campbell’s paradigm, suggesting that interventions aimed at changing behaviors can be more effective if they reduce the perceived costs of those behaviors, thereby making it easier for individuals’ attitudes to align with their actions.

Additionally, this approach to attitude-behavior studies illuminates the dynamic nature of attitudes and their expression in behavior. By focusing on the costs associated with behaviors, this paradigm provides a framework for understanding how different environmental and personal factors can influence the strength and directional flow of attitudes into behaviors. It challenges researchers and practitioners to rethink how attitude change interventions are designed and implemented, emphasizing the reduction of behavioral costs as a key strategy for promoting sustainable behavior change.

## Frame model for sustainability competencies (heading from EWM paper!)

Text from chatgpt – check!

The theoretical framework of the study centers on the development of sustainability competencies within the context of Education for Sustainable Development (ESD). Key sources highlight the necessity for well-defined ESD objectives, as evidenced in international agreements such as Agenda 21 and the World Decade of ESD, which emphasize the transformation of attitudes towards sustainable development. Despite these comprehensive goals, there exists a critical gap in the operationalization of these objectives, which hampers the empirical measurement of ESD outcomes. Existing educational research has attempted to address these shortcomings by suggesting the integration of empirically tested measurement tools from related fields such as environmental psychology and educational sciences. These tools aim to operationalize sustainability competencies by encompassing environmental knowledge, awareness, and behavior, thereby enhancing the efficacy of ESD interventions.

To further structure ESD learning goals and competencies, the Frame-Model for Sustainability Competencies has been proposed, drawing upon empirical educational research and the competencies model outlined by Weinert. This model categorizes sustainability competencies into three broad domains: cognitive, affective-motivational, and behavioral. Each domain is further divided into subcompetencies that detail specific cognitive abilities and skills necessary for addressing sustainability-related challenges across personal, social, and institutional contexts. The framework emphasizes the importance of integrating knowledge, skills, attitudes, and values to foster sustainable development and social cohesion. Moreover, the model allows for adaptability to different educational levels and contexts, ensuring that the competencies remain relevant and applicable to various sustainability challenges. This approach addresses the prevailing critiques in competency-based education by providing a structured yet flexible framework that encompasses a comprehensive set of sustainability competencies.

A diagram of a diagram

Description automatically generated

## Approaches for measuring

Also from ChatGPT

The section on "Approaches for Measuring Sustainability Competencies" delves into the development of measurement instruments essential for effectively gauging the impact of Education for Sustainable Development (ESD). This is particularly crucial for the more advanced levels of sustainability competencies (Levels 2 and 3), where existing operationalizations are sparse. To fill this gap, the section suggests utilizing established tools and tasks that reflect the subject-specific effects of ESD, particularly in school settings. It acknowledges the existing endeavors across various research disciplines that have started to define and measure the cognitive, affective-motivational, and behavioral dimensions of sustainability competencies. For instance, detailed instruments already developed for specific sustainability areas provide a foundation for measuring cognitive aspects, while qualitative approaches, such as those employed in certain regional studies, contribute to the field by offering preliminary operational frameworks.

The discourse extends to the operationalization of the affective-motivational and behavioral dimensions of sustainability competencies. For affective aspects, several scales like the Greenpeace Sustainability Barometer and the Sustainable Development Values-Scale are highlighted as instrumental in evaluating attitudes and values related to sustainability. These tools, initially derived from environmental psychology, help in understanding the intricate relationships between environmental attitudes, values, and behaviors, thereby supporting the broader spectrum of sustainability competencies. Similarly, for the behavioral dimension, scales such as the General Ecological Behavior (GEB)-scale have been pivotal in capturing sustainable practices and conservation behaviors. These measurement tools are vital for promoting actionable competencies in societal contexts, facilitating a comprehensive understanding and enhancement of sustainable behaviors.

Furthermore, the section underscores the importance of integrating existing tools from related fields to develop robust measurement instruments that can address the diverse facets of sustainability competencies. This approach not only enriches the empirical basis for ESD but also ensures that the measures are adaptable and relevant across various educational and social contexts. By leveraging interdisciplinary research and proven tools, the field of ESD can advance towards a more structured and effective evaluation of sustainability competencies, essential for fostering enduring sustainable development.