# Discussion

## Overview

Summary of most relevant findings and what it reveals, first explanations, first limitations?

Limitations

* Data very limited (n=7!)
* Test only non-parametric ones (can only show order)
* 🡪 Scalability

## Sustainability competences (TPB) over time and level of involvement (Research Question 1a/b)

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* Summary findings this question
  + Control group same or went down
  + Involved group: higher at t2, then again drop to more or less similar level than before
  + Involved/ control group: most different for behaviour and intention
* Other factors to look in, in research
  + SC change over time
  + Change over involvement (Pauli 🡪 importance long-term)
  + Method of intervention?
  + Change in different dimensions (Behaviour, Attitude) 🡪 BUGEN
  + Relevance indicators used (TPB)
* Reasons
  + Already previous interest from self-chosen group
  + Soziale Erwünschtheit (am Anfang zum MZP1) and at the end
  + Auseinandersetzung ohne SW-Erfahrung führt zu Abfall (Klima-Emotionen!) oder positive Verstärkung
  + ihrer Metastudie fanden O’Flaherty und Liddy nur einen kleinen Anteil Studien, die keinen signifikanten Effekt von Bildung für nachhaltige Entwicklung auf nachhaltigkeits-relevante Aspekte feststellen konnten (2018, S. 1038).
  + BUGEN bzw Waltner article methods
    - Age of students (older students higher knowledge, linked to other dimensions?)
  + 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: no change in attitudes and behaviour through year
    - Attitude went down
    - ESD not about to form attitudes and behaviour
    - 🡪 more about critical, independent decision making
  + 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.
* Other determining factors of the study
  + („Mismatch“/ Difference in) GOALS! Aim of study: also democratic aspects, weren’t considered here 🡪 difficult to make statements about effect of project  
      
     RIESS the concept of goal presented by this group has the following advantages over many common alternatives. The various disciplines and subjects can locate their subject-specific, sustainability-relevant goals within an overall framework for ESD, and the division into proven competency facets of educational research makes it possible to operationalize ESD goals and thus develop measurement instruments for ESD.
  + Can and should behavioral change be outcome of study?
  + Age, Gender, school marks when coming to knowledge
  + 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)].
  + Schulform? In der wissenschaftli-chen Literatur wird diese Verbindung zwischen BNE und Montessori bereits untersucht (vgl. Howaida Sayed, 2017; Lewis, 2012).
  + Influence of teachers (REF WALTNER) 🡪 high environmental consciousness( importance BNE 🡪 less succesful (Reaktanz der SuS?)
  + Importance media, other factors like FFF
  + Stellenwert BNE an Schule (Whole School Approach!)
  + 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).
  + are the tools employed for measurement adequate?
  + are measurement tools assessing what is distinctive to DE/ESD/GCED education?
* Implications/ my findings highlight that
  + ESD research can benefit Using empirical, long-term data?
  + Relevance of asking the right questions? TPB limited, because ?? (also debate about whether behavioral change should be outcome!)
  + As important contribution to normative debate, through empirical insights
    - Same weighing or different, depending on societal relevance?
    - Based on def in educational plans: need to shift more to behavioural aspects (away from cognitive components?) 🡪 more impact focused research (Nielsen et al 21)
  + Interesting, whether real lief outcomes for individuals and society (REF Kurz und Kubeck , 2021)

The presented method and instrument for operationalization of sustainability competencies picks up core competencies for students to enable them to shape a sustainable future. However, when dealing with competency models, this concurrently raises general questions about the possibilities of evaluation, definition and the seemingly antithetical need of openness of the ESD concept in order to stay adaptable to sustainability related challenges in the future. As Wals et al. conclude, “[*t*]he main point is that there is no single model of education and learning for environmental sustainability, nor should there be” [[**112**](https://www.mdpi.com/2071-1050/11/6/1717#B112-sustainability-11-01717)]. The conception of an adaptive and flexible concept of ESD, nevertheless, should not hinder our duty in the field of empirical research to create evidence via research programs, to verify if the undertaken programs of ESD show (the wanted) outcomes. We still argue that a focus on the ESD effects and learning outcomes is highly necessary to evaluate and improve the measures taken to enable learners to shape a sustainable future. Only if these further steps are taken can the compatibility of ESD with empirical research programs be guaranteed, and hence, its success be assessed.

## Sustainability competences (TPB) and self-efficacy beliefs (Research Question 2a/b)

### Self-efficacy as validation for TPB

* Summary findings
  + Confirmation validation
  + this shows that the two scales measure the same latent construct, namely, environmental attitude.
* Reasons findings
  + First scale already validated through participation FFF and impact-relevant behaviour
  + 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).
  + 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).
* Other potential explanations
* My findings highlight that
  + As a consequence, the competency differences which were assessed with this measurement instrument could point toward meaningful differences between the students which may have an actual impact on their future behavior.

Abgesehen von der Kritik am Instrument ist außerdem anzumerken, dass durch die zu-grundeliegende Theory of Planned Behavior nur eine bedingte Vorhersage des Verhaltens möglich ist (Armitage & Conner, 2001, S. 471; Kaiser et al., 2006, S. 2153). Intention kann demzufolge im Schnitt nur 27 % der Varianz des Verhaltens erklären (Armitage & Conner, 2001, S. 471; Bamberg & Möser, 2007, S. 23; Kaiser et al., 2006, S. 2153), auch wenn einzelne Studien Aufklärungsquoten von bis zu 95 % bescheinigen (Kaiser et al., 2006, S. 2160). Selbst der Modellbegründer Icek Ajzen hat die TPB im Laufe der Zeit weiterentwickelt, da augenscheinlich noch weitere Faktoren neben der Intention das Ver-halten beeinflussen (Bosnjak et al., 2020).

At timepoint 3: comparing individual self-efficacy and TPB between groups

### Self-efficacy beliefs and level of involvement (Research Question 2b)

#### Individual and collective self-efficacy beliefs between and within groups

* 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)
* Collective efficacy was better predictor of pro-evironmental behaviour than self-efficacy ((M-F Chen, 2015)
* Summary findings
  + No differences found
  + Individual SW higher than collective involved group
* Reasons
  + Relevance group?
  + Difficulty of task 🡪 changing sth for school as expert group, too difficult or maybe also decreased after nothing happened?
  + And desirability of aim?
  + 🡪 as research shows that collective efficacy highest, when medium task 🡪 maybe too difficult?
  + Link campbell and medium task 🡪 harder task was too difficult?
  + collective efficacy was significantly stronger when task difficulty was moderate rather than easy or difficult; and (b) that through specific collective and self-efficacy perceptions, sustainable intentions were gauged—even when controlling for attitudes and social norms. These findings suggest that collective efficacy beliefs are particularly relevant for attaining environmental goals that are neither too easy nor too difficult, and could thus be valuable for communication and policy strategies. (REESE; JUNGE)
  + this process is explained by the model of group-based control that postulates individuals can derive personal benefits (e.g., self-efficacy beliefs) from social groups because groups can make them feel personally capable and in control [[**31**](https://www.mdpi.com/2071-1050/9/2/200#B31-sustainability-09-00200),[**32**](https://www.mdpi.com/2071-1050/9/2/200#B32-sustainability-09-00200)]). In fact, Jugert et al. [[**12**](https://www.mdpi.com/2071-1050/9/2/200#B12-sustainability-09-00200)] could show that through collective efficacy, individuals came to feel in control of their outcomes: People’s intention to act was enhanced through providing a sense of efficacy transferred from the group to the self. Similarly, using a qualitative research approach, Cocking and Drury [[**11**](https://www.mdpi.com/2071-1050/9/2/200#B11-sustainability-09-00200)] found that collective efficacy led to a feeling of personal empowerment. Thus, with collective and self-efficacy being strong and closely intertwined predictors of pro-environmental action (
  + Supporting this assumption, Van Zomeren et al. [[**37**](https://www.mdpi.com/2071-1050/9/2/200#B37-sustainability-09-00200)] found that social action support significantly predicted collective efficacy. Second, behaviors that are easy usually have a weaker environmental impact per se. It is likely that people believe actions that are too easy (e.g., refraining from plastic bags) to be unlikely to make a big difference in environmental issues, even if they are collectively practiced. In other words, when actions are too easy, the (potential) success may not translate into feeling collectively efficacious. In short, this suggests that efficacy beliefs would be strongest for medium difficulty tasks.
  + 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 behavior in other domains—a finding in line with [26], who show that self-efficacy beliefs mediate between less difficult and more difficult behaviors. Our findings nicely complement this research, suggesting that such spill-over can also be mediated via collective efficacy beliefs.
* Other potential influences
* Implications
  + Integrate self-efficacy research into SC research: linking the aim of BNE to self-efficacy framework (wanting collective action as outcome?)
  + 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 behaviors that cost little but feel more efficacious through performing somewhat more difficult behaviors.

#### Aim and action focussed self-efficacy beliefs between and within groups

* Field of collective social and ecological aims is especially prone to aim-fiocussed understanding of self-efficacy because it fits complex nature of collective crisis (Zomeren,2019)
* For collective aims, the hardest part is not performing an action as such (e.g., going to a protest) but creating social change *with* this action. Individuals only have a very limited amount of control over collective outcomes ([Hornsey et al., 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056); [Jugert et al., 2016](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr183-10888683231178056)). Moreover, many barriers lie outside of the individual and are informed by the actions of powerful others; feedback is much more difficult to receive as aims are rather distal (e.g., the impact of an awareness campaign on people’s opinions is difficult to detect; [Hornsey et al., 2021](https://journals.sagepub.com/doi/10.1177/10888683231178056#bibr163-10888683231178056)).[3](https://journals.sagepub.com/doi/10.1177/10888683231178056#fn3-10888683231178056)
  + - * + 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)).

🡪Many actions could (or not) lead to one aim

* 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
* Summary findings
  + Involved group did score higher in both action and aim, than control group, but only aim significantly different
  + Involved froup slightly higher in aim than action
* Reasons
  + Desirability of aim?!
  + Different results regarding predictive power of the links
  + Reese and Jung suggest that agent-action-aim better predictor for more concrete intentions, whether agent-aim of more general
  + No other empirical data to compare to other than reese and jung
* Other potential influences
* Implications
  + Need to check for desirability of aim in pilot test in future?
  + Barriers from the outside? Aim is more desirable of involved group, but actions do not seem promising?
  + Actions asked not relevant?

GENERAL

* 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.

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*.

## Study limitations

“Analyses of biodiversity change can be limited by insufficient and imbalanced taxonomic, spatial and temporal data.”

* Applicability in other contexts (Cultural etc)

## Future directions

* 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.
* are forms of assessment employed relevant and appropriate? (epistemologically)
* A performance measurement approach to project management insists on the inclusion and development of indicators of expected change, assessment of baseline, stated targets and validation tools to provide evidence of change. This results-orientated approach emphasises efficiency and accountability in public spending, with clearly defined outputs, and results demonstrating value for money. (Oflaherty, Liddy, 2018)
* Consequently the development of indicators and outcomes is more complex and relates to the researcher/educators’ definition of development education, as addressed earlier. This product outcome focus misses the distinctiveness of DE/ESD/GCED, where the learning outcomes may be in the form of questioning and activism, rather than immediate or short-term goals.

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.