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RESEARCH ARTICLE



# Enabling effective education for sustainable development: Investigating the connection between the school organization and students' action competence

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## ABSTRACT

In this study, we investigate the relation between the school organization and outcomes of education for sustainable development, namely students' action competence in sustainable development. Data were collected among 629 students. At the organizational level, we collected data among 207 school staff concerning organizational characteristics including school resources, sustainable leadership, pluralistic communication, supportive relations, collective efficacy, adaptability, democratic decision-making, and shared vision. Results indicate that the school organization is primarily connected to students' knowledge and willingness. They also show that organizational characteristics such as sustainable leadership, pluralistic communication, adaptability, and democratic decision-making have a significant correlation with student level outcomes.

## KEYWORDS

action competence; education for sustainable development; school effectiveness; school organisation

## School effectiveness research in ESD: Adding perspectives to a pluralistic research area

Achieving a sustainable future for all individuals and moving beyond today's unsustainable reality requires a shift at all levels of society. In such a shift toward sustainability, education has a vital role to play (Wals et al., 2017). This study aims to contribute to the effectiveness of education for sustainable development (ESD) by exploring the connection between the school organization and ESD outcomes. Concomitant with an increase in ESD research and implementation, some scholars advocate the need for empirical evidence concerning the effects and outcomes of ESD (Boeve-de Pauw et al., 2015; Laurie et al., 2016). Nevertheless, uneasiness toward effectiveness and quantitative research remains, leading other scholars to favor a pluralistic paradigm (Rudsberg & Öhman, 2010; Van Poeck et al., 2018). The latter perspective assumes that *normative* effectiveness research cannot adequately represent the complexity of sustainability issues. The pluralistic paradigm presumes that it is unattainable to define universally applicable guidelines in ESD and argues that assessing the outcomes and effectiveness of ESD implies a predetermined disposition regarding those guidelines (Van Poeck et al., 2018). Reflective of the normative versus pluralistic fault line in ESD research, the methods and often large-scale approach of quantitative, multilevel research may raise additional challenges to ESD research concerning the school organization.

This fault line and critical perspectives concerning effectiveness research have led to many ESD studies on the school organization adopting a qualitative approach (e.g. Iliško & Badyanova, 2014; Leo & Wickenberg, 2013; Mogren & Gericke, 2019). Moreover, it is noticeable that effectiveness research remains scarce in the area of ESD and related fields such as environmental education (Boeve-de Pauw et al., 2015; Kopnina & Meijers, 2014). Though qualitative studies offer valuable insights into how schools and school

organizations work with and toward ESD, they provide limited evidence of the characteristics that make the school organization ESD effective.

Although scarce, some ESD effectiveness-oriented studies are available, and several have found evidence for a connection between school level variables and sustainability related student level variables. For example, Boeve-de Pauw et al. (2015) showed that ESD as an educational approach has a positive effect on students' sustainability consciousness; however, they did not include school organizational variables in their study. Coertjens et al. (2010) study used data from the 2006 Program for International Student Assessment (PISA) survey to investigate the influence of both student and school level factors on the environmental attitudes of students. Although they found that schools do have a minimal influence on students' environmental attitudes, their explanatory variables at the school level related to teaching practices and did not provide insight into schools' organizational functioning. Also using PISA 2006 data, Duarte et al. (2017) found that schools influence environmental attitudes. While they did include explanatory variables at the school level, these were descriptive in nature (e.g., private or public schools, location, student-teacher ratio). As a result, this study also lacked insights into organizational functioning with regard to characteristics such as leadership, communication climate, and supportive relations.

To date, only a limited number of studies have attempted to unravel the relation between the school organizational level and educational outcomes of ESD. With their focus on relevant yet different aspects of the school organizational level, existing studies offer a fragmented approach. Cincera and Krajhanzl (2013) investigated factors that support the development of action competence as part of an evaluation of the ECO-Schools program in the Czech Republic. They found that participating in decision-making processes via teacher-student collaboration in *EcoTeams* at the school created opportunities for students to develop their action competence. Moreover, in a large-scale, quantitative study, Boeve-de Pauw and Van Petegem (2018) investigated the effects on teachers and students of ECO-Schools in Flanders. Their results showed that support among the school staff and shared leadership resulted in a decrease in student factors that negatively influence pro-environmental behavior. They included a broad spectrum of organizational characteristics such as the policy-making capacity of the school (Vanhoof & Van Petegem, 2009). Recently, Schröder et al. (2020) identified five components related to the school climate that contribute to student participation in ECO-Schools activities, a strong relation with the community, and an adaptive and reflective approach. While they provided evidence concerning a number of school factors that facilitate ESD implementation, Schröder et al. (2020) noted that their five components do not cover the complete range of factors influencing ESD implementation. In their conclusion, they called for more research on guidelines for ESD implementation within schools. Together, these findings from existing effectiveness research on ESD demonstrate the opportunities that a more quantified and effectiveness-oriented research paradigm could offer for furthering understanding of how school organizations can enable ESD and ESD related outcomes.

With UNESCO (2020) calling for a transformation of learning environments and the alignment of the school with sustainable development principles, further quantitative research on the school organizational level will play a crucial part in facilitating "a whole-institution approach to ESD to enable learners to live what they learn and learn what they live" (p. 8). As school organizations should provide a strong foundation for ESD implementation (Scott, 2013), a clearer understanding of the influence organizational characteristics have on ESD outcomes will enable school organizations to develop and implement effective ESD. Seeing that research areas such as school management and educational effectiveness provide a considerable knowledge base for how school organizational characteristics relate to educational outcomes (Creemers & Kyriakides, 2008; Hoy et al., 2013; Scheerens, 1990; Teddlie & Reynolds, 2006), these research areas provide opportunities to expand our knowledge of how school organizations can effectively enable ESD. Moreover, the current fault line between normative and pluralistic perspectives in ESD research shows several similarities with the development of school effectiveness and school improvement as research areas. Thus, ESD research has an opportunity to leap ahead of the current discussion of effectiveness research in a pluralistic and diverse research area and learn from school effectiveness and school improvement research. The framework by Nikel and Lowe (2010) provides a contemporary, multidimensional perspective on school effectiveness that can work in a pluralistic research area such as ESD since "there is nothing within this understanding of 'effective' that demands that the actual nature of the

aims or the process that has led to their selection become the focus” (Nikel & Lowe, 2010, p. 596). With school effectiveness we refer to the search for those (organizational) conditions that enable schools to achieve desired output measures (Scheerens, 2016), without insinuating that those outcomes are the only valid or desirable outcomes for ESD.

## Study objective

In the present exploratory study, we investigate the relationship between the school organization level and outcomes of ESD. The conceptual framework of action competence in sustainable development (ACiSD) functions as one potential outcome of ESD (Sass et al., 2020). We connect students’ ACiSD to organizational characteristics to identify which organizational characteristics are found to go together with desirable outcomes of ESD. Although our methods do not support claims concerning causal relationships or detailed insight into the mediating effects of the school organizational level on other aspects of ESD (e.g., teaching practices), they do provide insight into the relationship between the school organization and ACiSD. This provides an important first step toward identifying organizational factors facilitating ESD effectiveness. The following research questions guide this study:

1. To what extent does the school organization account for differences in students’ ACiSD?
2. Which characteristics of the school organization are related to the different components of students’ ACiSD?

## Outcomes and characteristics of an ESD effective school

In the following section, we discuss the conceptual framework for (ACiSD) as a desired outcome of ESD. Next, we describe the characteristics of a school organization that are hypothesized to be central to ESD effectiveness.

### Action competence as an output measure of school effectiveness

There is a long tradition of measuring student achievement in traditional school subjects such as mathematics as a school effectiveness measure (Reynolds et al., 2014; Thomas et al., 1997). Concern for *normative validity* (Biesta, 2009), referring to the need to measure what you value, not what is easy to measure, has led to an increase in non-cognitive student outcomes as effectiveness criteria in contemporary school effectiveness research (Reynolds et al., 2014). ESD aims to empower students to make informed decisions and take action toward local and global issues related to SD (UNESCO, 2016), so a finite and determined outcome measure implies serious concern for normative validity since such a measure cannot accommodate the inherent complex and changeable nature of SD issues (Sass et al., 2020).

Action competence (AC) as the competence of a student or a group has been forwarded as a valid and measurable outcome of ESD (Cincera & Krajhanzl, 2013; Olsson et al., 2020; Sass et al., 2020). The development of this concept knows its own fault line, with some scholars seeing it as an educational approach of reflectivity, democracy, and participation, rather than as a measurable competence (Mogensen & Schnack, 2010). While we recognize the value of this *pluralistic* perspective, in this study we conceptualize AC as a competence of people compromising both cognitive and non-cognitive outcomes of ESD connected to students’ possibility and capacity to take action for sustainability (Sass et al., 2020).

Sass et al. (2020) define *action competence in sustainable development* (ACiSD) as comprising four dimensions oriented toward action for sustainable development: knowledge, willingness, capacity expectations, and outcome expectancy. *Knowledge* of action possibilities refers to knowledge about the sustainability issue and the processes involved in addressing the issue. This knowledge combines understanding, reflective capacities, and a system-wide perspective. Secondly, *willingness* to undertake action for SD is reflected in a commitment to find solutions for SD-issues and a willingness to interact with others and reflect on different options. Third, *capacity expectations* refers to students’ confidence

in their own skills and capacities to undertake successful action (for SD). The focus here lies on their confidence in their own efficacy. Confidence in the outcome of the action is addressed in the fourth component, *outcome expectancy*. Students with high outcome expectancy are confident that the action(s) they undertake will result in a desired outcome.

The theoretical description of AC(iSD) as a competence with a practical application illustrates that the four components of AC(iSD) have the potential to serve as valuable measurement constructs for ESD outcomes (Cincera & Krajhanzl, 2013; Olsson et al., 2020; Sass et al., 2020). By using ACiSD as an outcome measure, ESD school effectiveness studies can measure what is valued in ESD: students' commitment, passion, knowledge, and confidence in engaging with SD issues.

### **School organizational characteristics influencing learning outcomes in ESD**

A critical literature review by Verhelst et al. (2020) identified eight organizational characteristics that are hypothesized to facilitate ESD school effectiveness: school resources, sustainable leadership, pluralistic communication, supportive relations, collective efficacy, adaptability, democratic decision-making, and shared vision. In a follow-up study, Verhelst et al. (2021) interviewed 19 teachers and school leaders on their conceptualization of these characteristics and whether they contribute to ESD effectiveness. As argued by the authors, an ESD effective school embodies these characteristics and provides an organizational level that is enabling for ESD. This organizational level transcends the individual teacher, student, and classroom level (Verhelst et al., 2020). In the following paragraph, we provide a brief description of this organizational level framework.

'Sustainable leadership' and 'school resources' shape the subcontextual level of the school organization. The reciprocal relationship between these two subcontextual characteristics sets the stage for the conditions within school organization. The *school's resources* are made up of three components: *time management*, referring to the available time, how it is allocated and scheduled; *professional structures*, referring to different professional roles (i.e., ESD coordinator, subject teacher, school leader) and the way they are grouped and organized (i.e., workgroups, collaboration, hierarchical structure) (Hoy et al., 2013); and *physical structures*, referring to the school organization's physical means (i.e., available infrastructure and finances). *Sustainable leadership* indicates a type of leadership that is holistic, involving an integrated view of the past, present, and future, locally and elsewhere (Hargreaves & Fink, 2006). Notably, this integrated perspective goes further than temporal or spatial aspects alone: sustainable leadership will actively develop all aspects of the organization (e.g., the professional capacities of the team) so that continuous learning and development contributes to achieving the long-term holistic strategy of the school organization (Fullan, 2006; Hargreaves & Fink, 2006). Sustainable leadership is not necessarily a one-person show; there can, or even should be multiple sustainable leaders within a school organization. For example, a teacher could undertake sustainable leadership when they coordinate an ESD project at the school (Verhelst et al., 2020; Verhelst et al., 2021).

The six central characteristics that are situated within the school organization's internal context are shaped by the subcontextual characteristics. A first central characteristic, *pluralistic communication* refers to acknowledging different perspectives on ESD and engaging in a dialogue between all members of the school organization (e.g., staff, teachers, students). An important aspect of pluralistic communication is the ability to engage in critical self-reflection about personal or organizational perspectives when engaging in a dialogue. This type of communication shapes the way people within the school organization communicate among themselves, as well as with stakeholders outside of the school organization. Secondly, *supportive relations* refers to the supportive relations within a school's team, such as among a teaching team, or with external partners or other schools. Third, *collective efficacy* refers to the confidence of the school (team) in their ability to have a positive effect on student learning outcomes (Bandura, 1997; Hoy et al., 2013). In the case of an ESD effective school organization, it means that the school is confident that they organize and deliver effective ESD and that they positively influence students' ACiSD. Fourth, *democratic decision-making*, or the involvement of all relevant stakeholders and their perspectives in decision-making processes at the school organization, will contribute to the effectiveness of the school

organization itself (Harber & Trafford, 1999; Leithwood & Mascal, 2008). These stakeholders and their perspectives can come from within the school (e.g., staff or students) or outside the organization (e.g., parents or the neighborhood). Fifth, the *shared vision* of a school organization involves a collective understanding of what ESD means for the organization and provides the motivation to work on ESD. Lastly, the *adaptability* of the school organization involves the ability to adequately adapt as internal and external demands require. Knowing when to adapt and when not to is an important trait of an effective school organization. The adaptability of an ESD effective school refers to the ability of the school to adapt (or not) toward more effective ESD.

All characteristics, both central and subcontextual, are interrelated. For example, when giving meaning to ESD, a pluralistic manner of communicating and the ability to make a supported decision will lead to high levels of support and motivation among team members, which in turn will have a positive influence on the educational outcomes of the school organization (Verhelst et al., 2021). Hypothetically, an ESD effective school organization manifests these eight characteristics in ways that facilitate the four components of students' ACiSD (Verhelst et al., 2020). The framework for an ESD effective school organization allows for a more development-oriented perspective compared to other frequently used school level variables (e.g., private or public school, school location, student/teacher-ratio).

School organizations themselves can develop on each of the organizational characteristics; for example, the organization can decide to invest in a shared vision to have a better understanding of the how's and why's for working on ESD. In contrast, it is much harder for a school organization to change their student-teacher ratio (this often depends on external funding) or the location of the school. Arguably, this perspective on the organizational context in school effectiveness will offer schools and researchers further insight into tangible and alterable organizational characteristics for reform and development aimed at achieving the desired outcomes of ESD (Harris et al., 2015).

## Methods

### *Sample and data collection*

The present study utilized a convenience sample of Flemish primary and secondary school students and teachers of who participated in the VALIES research project: a research and development project focused on schools that seek to implement ESD. Participation in the VALIES research project was voluntary. Schools were informed of the research project via a cooperation between the project and the catholic and provincial educational umbrella organizations and an open call. In total, 51 schools participated. However, as the questionnaires were voluntary, not all schools participated in the data collection part of the project. Moreover, we determined that data at both the student and the organizational level were needed to answer the study's research questions; thus, we omitted schools with insufficient data from students or staff (Hox, 2010). We retained schools with a response rate of 15 or more students. For school level data, a minimum response rate of 10 staff members (teachers and other staff members) within secondary schools was adopted. As primary schools tend to have fewer staff members, we individually evaluated whether a school with fewer than 10 complete responses should be retained. Our final sample consisted of 629 students and 207 staff members distributed among 18 schools (8 primary schools and 12 secondary schools).

The student sample was representative with respect to gender, with 49.7% of students identifying as "boy," 49.4% identifying as "girl," and the remainder identifying with another gender or not disclosing their gender. All students were in the fifth and sixth grade of secondary education or in the first and second grade of primary education. The school staff sample consisted of 59.6% who identified as "woman" and 31.7% who identified as "man"; the remaining 8.7% identified as another gender or indicated that they did not want to disclose their gender. Most adult respondents were teachers (77%), and the other respondents were staff with a coordinating, managing, or advisory role or who served in another supportive position. All participants (and parents or legal guardians in the case of participating students)



provided active informed consent for the collection and use of their data and were aware they could discontinue their participation at any time. A privacy officer was appointed to this research project and oversaw ethical aspects throughout the research process.

### **Variables and questionnaires**

Data were collected via two questionnaires: one for students and one for school staff. We first describe the student questionnaire and outcome variables. Thereafter, we describe the organizational level questionnaire and variables.

#### **Student level variables**

Student data were collected using the ACiSD-Q (Sass et al., 2021). This questionnaire operationalizes the construct of ACiSD into a measure consisting of four nine-item scales for the four dependent variables in this study: students' knowledge of action possibilities, willingness, capacity expectations, and outcome expectancy. Each of these variables was related to their action possibilities for sustainable development. A five-point Likert scale, ranging from "completely disagree" to "completely agree," was used to record students' responses. Table 1 features a sample item for each of the four components of ACiSD, together with descriptive statistics for the student sample. At the student level, we also controlled for gender. Previous research has demonstrated influence of gender on students' environmental attitudes (Boeve-de Pauw et al., 2014), so we included gender as a control variable at the student level.

#### **School organizational variables**

For the school organizational characteristics, individual school staff data were collected via the ESD school organizational questionnaire (ESD SOQ) (Verhelst et al., 2022). This questionnaire consisted of 11 scales concerning the different characteristics of an ESD effective school (Table 2). Pluralistic communication, democratic decision-making, adaptability, collective efficacy, shared vision, and sustainable leadership were each measured via a separate scale. Supportive relations were divided into two separate scales: one for supportive relations within the school and one for supportive relations with external partners. As the resources of the school consisted of three categories, each of these categories was also measured via its own scale. The 11 scales of the ESD SOQ consisted of four to six items each, all of which were measured via a five-point Likert scale ranging from "completely disagree" to "completely agree." Table 2 provides sample items from the ESD SOQ, the psychometric properties for each scale, as well as the intra-class correlation coefficients (ICC) of each school characteristic.

All school level variables were aggregated to attribute school scores for organizational characteristics to the individual student data. To justify the aggregation of the lower level data (collected among the individual staff members) into school scores, a measure of within-group agreement was needed (Woehr et al., 2015). Our inspection of the ICC for the different characteristics of the ESD effective school organization demonstrated that individual respondents were likely to be clustered within the schools and could thus be used as aggregated variables (Peterson & Castro, 2006). We controlled for the educational level of the school (primary or secondary education). However, because the educational level did not correlate significantly with any of the dependent variables, it was not included as a control variable.

**Table 1.** Descriptive statistics for the dependent variables.

ACiSD subscale	Example item (original in Dutch)	$\alpha$	$\bar{x}$	SD
Knowledge	People contribute to a good life for everyone without damaging the planet if they treat boys and girls as equal.	0.79	4.15	0.53
Willingness	I want to give clothes I do not use any more to people that live in poverty here with us.	0.80	3.94	0.30
Capacity expectations	I can save electricity and water at home.	0.74	3.94	0.56
Outcome expectancy	I contribute to a good life for everyone without damaging the planet if I save electricity and water at home.	0.83	4.11	0.59

**Table 2.** Descriptive statistics and sample items of the school organizational variables.

Scale	Sample item (original in Dutch)	Items	$\alpha$	$\bar{x}$	SD	ICC
Sustainable leadership	The school leadership makes efforts toward anchoring ESD-initiatives on the long term.	5	.84	3.51	0.22	0.13
Time management	At this school, lessons are scheduled in such a way that they facilitate cross-curricular ESD activities.	6	.91	3.13	0.32	0.15
Professional structures	At this school, we devote a lot of attention to who works with whom in order to facilitate ESD.	6	.85	3.61	0.43	0.31
Physical structures	At this school, the infrastructure shows that we are working on ESD.	4	.66	3.03	0.31	0.27
Pluralistic communication	At this school, we are allowed to be critical about ESD.	5	.91	3.86	0.26	0.08
Democratic decision-making	At this school, teachers are involved when making decisions about ESD.	6	.90	3.35	0.29	0.14
Adaptability	At this school, we are open to ESD-related suggestions from inside our school (e.g., teachers, students, staff).	4	.85	3.78	0.22	0.19
Supportive relation w/ school team	At this school, there is a pleasant atmosphere among colleagues when working on ESD.	5	.85	3.33	0.30	0.24
Supportive relations w/ external partners	This school is stronger when it comes to ESD thanks to the cooperation with external partners.	6	.94	3.10	0.32	0.10
Collective efficacy	At this school, we are convinced that we can provide good ESD to our students.	5	.84	3.40	0.30	0.22
Shared vision	At this school, we work on ESD because we think it is important as a school.	4	.76	2.95	0.43	0.27

## Analyses

All variables were standardized prior to analysis. For the control variable “gender,” we created a dummy variable (Lorah, 2018). As the nature of this study required an analysis method that took the nested structure into account, all analyses consisted of random intercept multilevel models that allowed us to examine the influence of the school level on student outcomes as well as the relation between each of the school organizational characteristics and the dependent variables in this study. All analyses were conducted in R using the lme4-package for linear mixed effects models (Bates et al., 2015).

The first step of the analysis involved the estimation of null models for the four dependent variables: knowledge, willingness, capacity expectations, and outcome expectancy. Inspecting the ICC for each dependent variable provided the proportion of the total variance explained by the school level. The value of the ICC indicated the amount of variance within a dependent variable attributed to the schools’ organizational characteristics or other/not included school level variables.

The second step involved running four exploratory models with a composite variable, school organization, which included all independent variables as an explanatory variable on the four components of ACiSD. To create the composite school organization variable, we first inspected the correlation matrix (Table 3) of the school level variables to determine whether they were, in addition to being conceptually related, also statistically related (Ley, 1972; Song et al., 2013). We also controlled for gender in each model. To assess the model fit, we applied an information-theoretic approach using the AIC (Burnham et al., 2011) together with the difference in deviance ( $-2 \log$  likelihood) between these models and the respective null models.



**Table 3.** Correlation matrix for the independent variables (i.e., school organizational characteristics).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Sustainable leadership (1)	1.00										
Time management (2)	0.68	1.00									
Professional structures (3)	0.70	0.70	1								
Physical structures (4)	0.13	0.21	−0.02	1							
Pluralistic communication (5)	0.47	−0.04	0.31	0.20	1						
Democratic decision-making (6)	0.85	0.57	0.79	0.24	0.73	1					
Adaptability (7)	0.81	0.73	0.73	0.28	0.38	0.74	1				
Supportive relations school team (8)	0.74	0.54	0.77	0.40	0.71	0.91	0.71	1			
Supportive relations w/ external partners (9)	0.67	0.66	0.65	0.33	0.44	0.76	0.71	0.64	1		
Collective efficacy (10)	0.70	0.68	0.65	0.32	0.46	0.72	0.80	0.81	0.47	1	
Shared vision (11)	0.68	0.60	0.63	0.39	0.50	0.77	0.60	0.81	0.69	0.71	1

Following the models with the composite school organization variable, we explored the relations between the school organizational characteristics and the four components of ACiSD. To do so, we estimated separate random intercept models for each independent variable on each dependent variable, while controlling for gender. The outputs of these models enabled our identification of the school organizational variables related to the components of students' ACiSD.

For the final step, and to further explore the data, we ran four models with those variables that demonstrated notable parameter estimates (i.e., significance  $\leq 0.1$ ) for one or multiple components of ACiSD. However, our inspection of the variance inflation factor (VIF) indicated an issue with multi-collinearity. As suggested by O'Brien (2007), we tried combining highly correlated independent variables into composite variables. However, this did not lead to an adequate solution. Therefore, we excluded the problematic variables from our models. As O'Brien (2007) noted, when deciding which variables to exclude, one should focus on their conceptual validity. Thus, we removed two dimensions from school resources (i.e., time management and physical resources) and one dimension from supportive relations within the school as these variables were conceptually related to one of the remaining variables (respectively, professional structures for school resources and supportive relations with external partners as the second component of supportive relations). Moreover, we omitted democratic decision-making as this variable highly correlated with sustainable leadership and pluralistic communication. The models with the remaining variables still provided a diverse number of school organizational characteristics without the issue of multi-collinearity, thus allowing for a preliminary exploration of correlations between the school organizational characteristics and the components of ACiSD.

## Results

To assess whether schools accounted for differences in the students' ACiSD (RQ1), the ICC values of the null models for knowledge, willingness, capacity expectation, and outcome expectations were calculated. An ICC value describes how much of a variance can be attributed to the group level – in this case, the school's organization. Our results (see Table 4) indicate that the school does explain differences in the student scores for all four dependent variables. This is most substantial for students' knowledge and willingness, with respectively 10% and 11% of the variance attributed to the school in which the students were enrolled. For the students' outcome expectancy, 7.1% of the variance was attributable to the school level. Moreover, while the school played a smaller part in explaining variation in students' capacity expectations, it still accounted for 4.6% of the variance.

Knowing that the school level explains a notable amount of the variance of all four components of ACiSD, we investigated whether the characteristics of the school organization are linked to the different components of students' ACiSD. A composite variable containing the combined average of all organizational characteristics as an independent variable proves to be a valuable way to explore the relation

**Table 4.** Fixed and random estimates and standard error (in parentheses) for the four separate mixed effects models with the average for school organization as a dependent variable.<sup>1</sup>

Fixed effects	Null models				Mixed effects models			
	Knowledge	Willingness	Capacity expectation	Outcome expectancy	Knowledge	Willingness	Capacity expectation	Outcome expectancy
Intercept	−0.016 (0.086)	0.015 (0.089)	−0.004 (0.066)	−0.006 (0.075)	0.199* (0.077)	0.301*** (0.068)	0.218** (0.071)	0.178* (0.077)
Gender <sup>2</sup>					−0.463*** (0.076)	−0.620*** (0.074)	−0.449*** (0.079)	−0.388*** (0.077)
School organization					0.422 (0.222)	0.435 (0.216)	−0.056 (0.197)	0.211 (0.223)
Random effects								
Student level								
Intercept	0.907	0.900	0.947	0.916	0.864	0.819	0.905	0.885
variance								
Standard deviation	0.952	0.949	0.973	0.957	0.930	0.905	0.951	0.941
School level								
Intercept	0.101	0.111	0.046	0.070	0.050	0.047	0.032	0.050
variance								
Standard deviation	0.318	0.334	0.214	0.265	0.223	0.217	0.178	0.223
ICC	10.0%	11.0%	4.6%	7.1%	5.5%	5.4%	3.4%	5.3%
Deviance <sup>3</sup>	1750.6	1747.4	1773.6	1758.1	1711.9	1678.3	1735.5	1726.3
AIC	1756.6	1753.4	1773.6	1758.1	1721.9	1688.3	1745.5	1736.3

between the school organization and outcomes of ESD. Table 4 provides an overview of the four mixed effects models with the school organization as an independent variable. Both the AIC and difference in deviance for all models demonstrate that the models fit the data better than the null models. While the influence of gender was not the focus of the present analysis, results demonstrated negative parameter estimates for gender on each component of ACiSD, meaning that being a boy is connected to having lower scores on all four components of ACiSD.

Regarding the school organization, noteworthy estimates are found for both knowledge and willingness, with estimates of 0.42 (with a standard error of 0.22) for school organization on knowledge and 0.44 (with a standard error of 0.22) for willingness. Both estimates are on the verge of statistical significance, with  $p$ -values of 0.073 and 0.057, respectively. To a smaller extent there is also a correlation between the school organization and outcome expectancy of 0.22 (with a standard error of 0.22). As to the variance explained by these models, an easy and solid statistic is not always available or feasible in multilevel analyses (LaHuis et al., 2014). However, looking at the ICC values, 5.5% of the unexplained variance in the students' knowledge related to ACiSD is attributed to the school. For willingness, the ICC indicates that 5.4% of the unexplained variance was attributable to the school.

Investigating the relations between the separate school characteristics and the components of ACiSD provides a more detailed account of which organizational characteristics are linked to the outcomes of ESD (RQ2). The results of the separate models in Table 5 present an answer to our second research question. These results indicate that democratic decision-making, adaptability, and sustainable development correlate with both knowledge and willingness, even after controlling for gender. In addition, a significant correlation is found between pluralistic communication and willingness. All these correlations range between 0.33 and 0.59. Moreover, while not significant at  $p = 0.05$ , several other notable correlations are found between almost all organizational characteristics and one or more components of ACiSD, indicating that within our sample there was a connection between the school organizational characteristics and outcomes of ESD.

Lastly, when combining independent variables that stood out in the previous analysis into one model (Table 6), we determine that only some of the school organizational characteristics correlates with the components of ACiSD when controlling for the other independent variables in the model. Positive correlations between sustainable leadership and both knowledge (estimate = 0.582;  $p = 0.051$ ) and willingness

**Table 5.** Fixed effects estimates and standard error (in parentheses) of the separate mixed effects models with the school characteristics as independent variables, while controlling for gender.<sup>4</sup>

	Knowledge	Willingness	Capacity expectation	Outcome expectancy
Pluralistic communication	0.339 (0.168)	0.364* (0.163)	0.234 (0.146)	0.226 (0.167)
Democratic decision-making	0.358* (0.162)	0.381* (0.157)	0.041 (0.150)	0.162 (0.167)
Adaptability	0.394* (0.180)	0.441* (0.168)	0.064 (0.163)	0.227 (0.180)
Supportive relations school team	0.217 (0.151)	0.272 (0.143)	−0.003 (0.130)	0.150 (0.146)
Supportive relations w/ external partners	0.247 (0.172)	0.162 (0.174)	−0.114 (0.140)	−0.018 (0.168)
Shared vision	0.186 (0.120)	0.154 (0.121)	−0.045 (0.103)	0.041 (0.120)
Collective efficacy	0.242 (0.134)	0.236 (0.132)	0.006 (0.120)	0.165 (0.132)
Sustainable leadership	0.557** (0.178)	0.594** (0.167)	0.084 (0.180)	0.332* (0.192)
Time management	0.061 (0.200)	0.072 (0.198)	−0.231 (0.152)	−0.048 (0.188)
Professional structures	0.155 (0.132)	0.214 (0.122)	−0.073 (0.107)	0.043 (0.126)
Physical structures	0.056 (0.164)	−0.110 (0.160)	−0.223 (0.124)	0.044 (0.154)

**Table 6.** Fixed and random estimates and standard error (in parentheses) for the four separate mixed effects models with the components of ACiSD as dependent variables.<sup>5</sup>

	Null models				Mixed effects models			
	Knowledge	Willingness	Capacity expectation	Outcome expectancy	Knowledge	Willingness	Capacity expectation	Outcome expectancy
Fixed effects								
Intercept	−0.016 (0.086)	0.015 (0.089)	−0.004 (0.066)	−0.006 (0.075)	0.137 (0.074)	0.260*** (0.067)	0.191** (0.067)	0.140 (0.080)
Gender <sup>6</sup>					−0.443*** (0.077)	−0.606*** (0.075)	−0.423*** (0.079)	−0.374*** (0.078)
Pluralistic communication					0.264 (0.194)	0.212 (0.174)	0.415* (0.172)	0.178 (0.215)
Adaptability					0.056 (0.305)	0.198 (0.272)	0.183 (0.268)	−0.042 (0.338)
Supportive relations school team					−0.324 (0.238)	−0.151 (0.212)	−0.303 (0.209)	−0.171 (0.264)
Collective efficacy					0.096 (0.208)	−0.003 (0.187)	0.041 (0.185)	0.113 (0.230)
Sustainable leadership					0.582 (0.256)	0.528* (0.254)	0.006 (0.252)	0.326 (0.312)
Physical structures					−0.046 (0.136)	−0.250* (0.120)	−0.250* (0.117)	−0.035 (0.151)
<b>Random effects</b>								
<i>Student level</i>								
Intercept variance	0.907	0.900	0.947	0.9163	0.863	0.916	0.901	0.885
Standard deviation	0.952	0.949	0.973	0.957	0.929	0.903	0.949	0.941
<i>School level</i>								
Intercept variance	0.101	0.111	0.046	0.07018	0.026	0.016	0.012	0.037
Standard deviation	0.318	0.334	0.214	0.2649	0.160	0.127	0.111	0.193
ICC	10.0%	11.0%	4.6%	7.1%	2.8%	1.9%	1.3%	4.0%
Deviance <sup>7</sup>	1750.6	1747.4	1773.6	1758.1	1704.7	1666.2	1752.1	1717.5
AIC	1756.6	1753.4	1773.6	1758.1	1724.7	1686.2	1742.5	1737.5

(estimate = 0.528;  $p = 0.046$ ) were identified. Pluralistic communication demonstrated a strong positive correlation with capacity expectations (estimate = 0.415;  $p = 0.050$ ). Surprisingly, a negative parameter estimate existed between the schools' physical structures and the students' willingness and outcome expectancy after controlling for the other variables in the model.

## Discussion and conclusions

This study was designed to explore how the school organization is connected to students' action competence in sustainable development (ACiSD) as a desired outcome of ESD. It investigated which school organization characteristics are linked to different components of students' ACiSD. By doing so, this study heeds the call to bridge theoretical and empirical work in school effectiveness and acknowledges the role of the school organizational level in school effectiveness (Harris et al., 2015). Moreover, results build on existing conceptual and qualitative work in the area of ESD school effectiveness research (Verhelst et al., 2020; Verhelst et al., 2021) and offer several promising trajectories for future research.

The results support that the school organization is linked to outcomes of ESD to some degree, regarding students' knowledge and willingness as components of ACiSD. While the model with school organization as a composite variable did not provide a statistically significant estimate, we did find a notable correlation between the school organization and students' knowledge and willingness within our sample. Notably, the results indicate that the school in which students are enrolled is related to their knowledge and willingness concerning sustainable development issues. In consideration of the limited availability of empirical school organizational literature in the field of ESD (Boeve-de Pauw et al., 2015; Kopnina & Meijers, 2014), these findings suggest that there is much potential in investigating the influence of the school organization. Moreover, these results support the idea that school effectiveness research can examine a wide array of educational outcomes beyond cognitive measures (Reynolds et al., 2014), particularly when it comes to a valid measure of effectiveness for supporting complex outcomes for ESD.

Focusing on organizational characteristics, several characteristics described in our conceptual framework showed notable correlations with one or more components of ACiSD – namely, pluralistic communication, democratic decision-making, and sustainable leadership. This finding further substantiates the connection between organizational characteristics of the school and students' ACiSD. Moreover, this outcome is striking as these organizational characteristics show several similarities to concepts that were previously linked to positive educational outcomes in ESD (or related areas). For example, the concept of *adaptability* corresponds to the adaptive and reflective approach Schröder et al. (2020) identified as contributing to student participation in ECO-Schools activities. In addition, both our study and the Cincera and Krajhanzl (2013) study found a positive connection between AC(iSD) and decision-making processes at the school.

Throughout our analysis, it also became clear that sustainable leadership as an organizational characteristic is linked to higher values of ACiSD, especially when it comes to knowledge and willingness. While this result is supported by Boeve-de Pauw and Van Petegem (2018), who showed that shared leadership decreased student factors with a negative influence on pro-environmental behavior, the connection between leadership and educational outcomes is more often seen as an indirect relationship (e.g., Harris et al., 2013; Oldac & Kondakci, 2020; Witziers et al., 2003). Leadership literature often attributes school leadership a mediating role on school characteristics (Leithwood & Jantzi, 2000; Leithwood & Mascal, 2008) and it is therefore worthwhile to further investigate the influence of leadership on the different organizational characteristics. The research by Mogren and Gericke (2017) on transformational leadership and educational quality criteria offers several avenues for future exploration of the connection between leadership and school organizational characteristics in ESD. Next, the negative correlation found with physical structures is somewhat unexpected. Although these correlations could be explained as a reaction of schools that notice their students are not overly willing to take action toward SD, future research is needed to understand the underlying processes.

While our study addressed our research questions, it has certain limitations. First, our data were drafted from schools voluntarily participating in the VALIES research project. These schools were not a

representative sample of all schools in Flanders. As a consequence, the sample was limited and potentially biased since it was not a representation of all Flemish schools. The limited number of respondents and consequent limited statistical power for our study restricted our options to draft complex statistical models (Hox, 2010). The correlations that were found suggest that further research with a larger sample would be beneficial.

This aspect also factors into the second limitation. Specifically, the interdependency between different characteristics of the school organization (Verhelst et al., 2020) was not included in the study. Although a multilevel structural equation model (MSEM) would be able to take the mediation between the sub-contextual and the central level into account (Preacher et al., 2010), it would require a larger sample size due to the high number of estimated parameters. As our dataset did not meet the minimum ratio of 10:1 respondents for a parameter on the group level (i.e., schools) (Hair et al., 2010), we opted not to include the mediation between the different independent variables seeing that these are all situated at the group level. In addition, the size and composition of the sample at the organizational level, which consisted mainly of teachers, limited the possibility to investigate the relationships between different groups of staff within the school organization (e.g. teachers, management, administrative personnel). Further research can complement our study by investigating potential differences in different groups of staff.

Despite its limitations, the study is valuable as an exploratory investigation. It adds to understanding of the school organization's role in effectiveness of ESD and it highlights several opportunities for further research on the role of the school organization in ESD. To deconstruct (causal) relations between organizational characteristics and the outcomes of ESD, additional research is needed. Moreover, the application of an MSEM approach would enable independent variables to correlate, thus addressing both the issue of mediation between the independent variables and the issue of multi-collinearity in this study. Our results, in combination with existing knowledge, strengthen the understanding that organizational characteristics enable different aspects of working, thinking, and learning within a school, for example, classroom practices for ESD (Sinakou et al., 2019) and students' knowledge, competences, and attitudes (Sass et al., 2020). However, this study did not investigate how this mediating impact of schools' organizational characteristics on processes at other levels of the school organization (e.g. classroom practices) is manifested, as is often the case in effectiveness research (Reynolds et al., 2015), and should be considered in future research.

Our exploratory research into connections between the school organization and student outcomes in ESD provides a next step in the process of investigating what makes a school organization ESD effective. It established that there is indeed a connection between the organizational characteristics described in the framework for an ESD effective school (Verhelst et al., 2020) and ACiSD as a desired outcome of ESD at the student level (Sass et al., 2020). Nevertheless, it did not support causal claims as to the influence of the organizational characteristics of the school organization on students' ACiSD, nor was this the objective. On its own, this study provides a first glimpse into the black box that is effective ESD, but the true added value of this study lies in the various opportunities it offers to undertake follow-up research. Developing ESD research via a sequential multi-method paradigm, where conceptual, qualitative, and quantitative research builds on each other provides ample opportunities for developing an in-depth and valid understanding of the processes that shape ESD school effectiveness.

## Notes

1. Signif. codes: '\*\*\*'  $\leq 0.001$ , '\*\*'  $\leq 0.01$ , '\*'  $\leq 0.05$
2. Dummy variable set for "boy."
3. All -2-log likelihood tests were significant.
4. Signif. codes: '\*\*'  $\leq 0.01$ , '\*'  $\leq 0.05$
5. Signif. codes: '\*\*\*'  $\leq 0.001$ , '\*\*'  $\leq 0.01$ , '\*'  $\leq 0.05$
6. Dummy variable set for "boy."
7. All -2-log likelihood tests were significant.

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## References

- Bandura, A. (1997). *Self-efficacy: The exercise of control*. Freeman.
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. [*Sparse Matrix Methods; Linear Mixed Models; Penalized Least Squares; Cholesky Decomposition*], 67(1), 48. <https://doi.org/10.18637/jss.v067.i01>
- Biesta, G. (2009). Good education in an age of measurement: On the need to reconnect with the question of purpose in education. *Educational Assessment, Evaluation and Accountability*, 21(1), 33–46. <https://doi.org/10.1007/s11092-008-9064-9>
- Pauw, J., Gericke, N., Olsson, D., & Berglund, T. (2015). The effectiveness of education for sustainable development. *Sustainability*, 7(11), 15693–15717. <https://doi.org/10.3390/su71115693>
- Boeve-de Pauw, J., Jacobs, K., & Van Petegem, P. (2014). Gender differences in environmental values: An issue of measurement? *Environment and Behavior*, 46(3), 373–397. <https://doi.org/10.1177/0013916512460761>
- Boeve-de Pauw, J., & Van Petegem, P. (2018). Eco-school evaluation beyond labels: The impact of environmental policy, didactics and nature at school on student outcomes. *Environmental Education Research*, 24(9), 1250–1267. <https://doi.org/10.1080/13504622.2017.1307327>
- Burnham, K. P., Anderson, D. R., & Huyvaert, K. P. (2011). AIC model selection and multimodel inference in behavioral ecology: some background, observations, and comparisons. *Behavioral Ecology and Sociobiology*, 65(1), 23–35. <https://doi.org/10.1007/s00265-010-1029-6>
- Cincera, J., & Krajhanzl, J. (2013). Eco-Schools: What factors influence pupils' action competence for pro-environmental behaviour? *Journal of Cleaner Production*, 61, 117–121. <https://doi.org/10.1016/j.jclepro.2013.06.030>
- Coertjens, L., Boeve-de Pauw, J., De Maeyer, S., & Van Petegem, P. (2010). Do schools make a difference in their students' environmental attitudes and awareness? Evidence from PISA 2006. *International Journal of Science and Mathematics Education*, 8(3), 497–522. <https://doi.org/10.1007/s10763-010-9200-0>
- Creemers, B., & Kyriakides, L. (2008). *The dynamics of educational effectiveness: A contribution to policy, practice and theory in contemporary schools* (Vol. 1). Routledge.
- Duarte, R., Escario, J.-J., & Sanagustín, M.-V. (2017). The influence of the family, the school, and the group on the environmental attitudes of European students. *Environmental Education Research*, 23(1), 23–42. <https://doi.org/10.1080/13504622.2015.1074660>
- Fullan, M. (2006). The future of educational change: System thinkers in action. *Journal of Educational Change*, 7(3), 113–122. <https://doi.org/10.1007/s10833-006-9003-9>
- Hair, J. F., Jr., Anderson, R. E., Babin, B. J., & Black, W. C. (2010). *Multivariate data analysis: A global perspective* (7th ed.). Pearson education. <http://lib.ugent.be/catalog/rug01:001321386>
- Harber, C., & Trafford, B. (1999). Democratic management and school effectiveness in two countries: A case of pupil participation. *Educational Management & Administration*, 27(1), 45–54. <https://doi.org/10.1177/0263211X990271004>
- Hargreaves, A., & Fink, D. (2006). *Sustainable leadership*. Jossey-Bass.
- Harris, A., Adams, D., Jones, M. S., & Muniandy, V. (2015). System effectiveness and improvement: the importance of theory and context. *School Effectiveness and School Improvement*, 26(1), 1–3. <https://doi.org/10.1080/09243453.2014.987980>
- Harris, A., Day, C., Hopkins, D., Hadfield, M., Hargreaves, A., & Chapman, C. (2013). *Effective leadership for school improvement*. Routledge.
- Hox, J. (2010). *Multilevel analysis. techniques and applications* (2 ed.). Routledge.
- Hoy, W. K., Tarter, C. J., & Miskel, C. G. (2013). *Educational administration: Theory, research, and practice* (9 ed.). McGraw-Hill.



- Iliško, D., & Badyanova, Y. (2014). A case study of ESD implementation: Signs of sustainable leadership. *Discourse and Communication for Sustainable Education*, 5(1), 38–48. <https://doi.org/10.2478/dcse-2014-0004>
- Kopnina, H., & Meijers, F. (2014). Education for sustainable development (ESD): Exploring theoretical and practical challenges. *International Journal of Sustainability in Higher Education*, 15(2), 188–207. <https://doi.org/10.1108/IJSHE-07-2012-0059>
- LaHuis, D. M., Hartman, M. J., Hakoyama, S., & Clark, P. C. (2014). Explained variance measures for multilevel models. *Organizational Research Methods*, 17(4), 433–451. <https://doi.org/10.1177/1094428114541701>
- Laurie, R., Nonoyama-Tarumi, Y., McKeown, R., & Hopkins, C. (2016). Contributions of education for sustainable development (ESD) to quality education: A synthesis of research. *Journal of Education for Sustainable Development*, 10(2), 226–242. <https://doi.org/10.1177/0973408216661442>
- Leithwood, K., & Jantzi, D. (2000). The effects of transformational leadership on organizational conditions and student engagement with school. *Journal of Educational Administration*, 38(2), 112–129. <https://doi.org/10.1108/09578230010320064>
- Leithwood, K., & Mascal, B. (2008). Collective leadership effects on student achievement. *Educational Administration Quarterly*, 44(4), 529–561. <https://doi.org/10.1177/0013161X08321221>
- Leo, U., & Wickenberg, P. (2013). Professional norms in school leadership: Change efforts in implementation of education for sustainable development. *Journal of Educational Change*, 14(4), 403–422. <https://doi.org/10.1007/s10833-013-9207-8>
- Ley, P. (1972). *Quantitative aspects of psychological assessment* (Vol. 1). Duckworth.
- Lorah, J. (2018). Effect size measures for multilevel models: definition, interpretation, and TIMSS example. *Large-Scale Assessments in Education*, 6(1), 8. <https://doi.org/10.1186/s40536-018-0061-2>
- Mogensen, F., & Schnack, K. (2010). The action competence approach and the ‘new’ discourses of education for sustainable development, competence and quality criteria. *Environmental Education Research*, 16(1), 59–74. <https://doi.org/10.1080/13504620903504032>
- Mogren, A., & Gericke, N. (2017). ESD Implementation at the school organisation level, part 2 – Investigating the transformative perspective in school leaders’ quality strategies at ESD schools. *Environmental Education Research*, 23(7), 993–1014. <https://doi.org/10.1080/13504622.2016.1226266>
- Mogren, A., & Gericke, N. (2019). School leaders’ experiences of implementing education for sustainable development—anchoring the transformative perspective. *Sustainability*, 11(12), 3343. <https://doi.org/10.3390/su11123343>
- Nikel, J., & Lowe, J. (2010). Talking of fabric: A multi-dimensional model of quality in education. *Compare: A Journal of Comparative and International Education*, 40(5), 589–605. <https://doi.org/10.1080/03057920902909477>
- O’Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41(5), 673–690. <https://doi.org/10.1007/s11135-006-9018-6>
- Oldac, Y. I., & Kondakci, Y. (2020). Multilevel analysis of the relationship between school-level variables and student achievement. *Educational Management Administration & Leadership*, 48(4), 762–780. <https://doi.org/10.1177/1741143219827303>
- Olsson, D., Gericke, N., Sass, W., & Boeve-de Pauw, J. (2020). Self-perceived action competence for sustainability: the theoretical grounding and empirical validation of a novel research instrument. *Environmental Education Research*, 26(5), 742–760. <https://doi.org/10.1080/13504622.2020.1736991>
- Peterson, M. F., & Castro, S. L. (2006). Measurement metrics at aggregate levels of analysis: Implications for organization culture research and the GLOBE project. *The Leadership Quarterly*, 17(5), 506–521. <https://doi.org/10.1016/j.leaqua.2006.07.001>
- Preacher, K. J., Zyphur, M. J., & Zhang, Z. (2010). A general multilevel SEM framework for assessing multilevel mediation. *Psychological Methods*, 15(3), 209–233. <https://doi.org/10.1037/a0020141>
- Reynolds, D., Sammons, P., De Fraine, B., Van Damme, J., Townsend, T., Teddlie, C., & Stringfield, S. (2014). Educational effectiveness research (EER): A state-of-the-art review. *School Effectiveness and School Improvement*, 25(2), 197–230. <https://doi.org/10.1080/09243453.2014.885450>
- Reynolds, D., Teddlie, C., Chapman, C., & Stringfield, S. (2015). Effective school processes. In C. Chapman, D. Muijs, D. Reynolds, P. Sammons, & C. Teddlie (Eds.), *The Routledge international handbook of educational effectiveness and improvement: Research, policy, and practice* (pp. 77–99). Routledge.
- Rudberg, K., & Öhman, J. (2010). Pluralism in practice – Experiences from Swedish evaluation, school development and research. *Environmental Education Research*, 16(1), 95–111. <https://doi.org/10.1080/13504620903504073>
- Sass, W., Boeve-de Pauw, J., De Maeyer, S., & Van Petegem, P. (2021). Development and validation of an instrument for measuring action competence in sustainable development within early adolescents: The action competence in sustainable development questionnaire (ACISD-Q). *Environmental Education Research*, 27(9), 1–1304. <https://doi.org/10.1080/13504622.2021.1888887>
- Sass, W., Boeve-de Pauw, J., Olsson, D., Gericke, N., De Maeyer, S., & Van Petegem, P. (2020). Redefining action competence: The case of sustainable development. *The Journal of Environmental Education*, 51(4), 292–305. <https://doi.org/10.1080/00958964.2020.1765132>
- Scheerens, J. (1990). School effectiveness research and the development of process indicators of school functioning. *School Effectiveness and School Improvement*, 1(1), 61–80. <https://doi.org/10.1080/0924345900010106>
- Scheerens, J. (2016). *Educational effectiveness and ineffectiveness: A critical review of the knowledge base*, 389 pp. Dordrecht: Springer.

- Schröder, L.-M. U., Wals, A. E. J., & van Koppen, C. S. A. (2020). Analysing the state of student participation in two Eco-Schools using Engeström's Second Generation Activity Systems Model. *Environmental Education Research*, 26(8), 1088–1111. <https://doi.org/10.1080/13504622.2020.1779186>
- Scott, W. (2013). Developing the sustainable school: Thinking the issues through. *The Curriculum Journal*, 24(2), 181–205. <https://doi.org/10.1080/09585176.2013.781375>
- Sinakou, E., Donche, V., Boeve-de Pauw, J., & Van Petegem, P. (2019). Designing powerful learning environments in education for sustainable development: a conceptual framework. *Sustainability*, 11(21), 23. <https://doi.org/10.3390/su11215994>
- Song, M.-K., Lin, F.-C., Ward, S. E., & Fine, J. P. (2013). Composite variables: When and how. *Nursing Research*, 62(1), 45–49. <https://doi.org/10.1097/NNR.0b013e3182741948>
- Teddle, C., & Reynolds, D. (2006). *The international handbook of school effectiveness research*. Routledge.
- Thomas, S., Sammons, P., Mortimore, P., & Smees, R. (1997). Differential secondary school effectiveness: Comparing the performance of different pupil groups. *British Educational Research Journal*, 23(4), 451–469. <https://doi.org/10.1080/0141192970230405>
- UNESCO. (2016). *Education 2030: Incheon Declaration and Framework for Action for the implementation of Sustainable Development Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*. <https://unesdoc.unesco.org/ark:/48223/pf0000245656>
- UNESCO. (2020). *Education for sustainable development: a roadmap* <https://www.gcedclearinghouse.org/sites/default/files/resources/200782eng.pdf>
- Van Poeck, K., König, A., & Wals, A. E. J. (2018). Environmental and sustainability education in the Benelux countries: Research, policy and practices at the intersection of education and societal transformation. *Environmental Education Research*, 24(9), 1234–1249. <https://doi.org/10.1080/13504622.2018.1477121>
- Vanhoof, J., & Van Petegem, P. (2009). Beleidvoerend vermogen: herkomst, omschrijving en toekomst van een 'begrip' in het hedendaagse schoolbeleidsdenken [Policy making capacity: origin, description and future of a 'concept' in contemporary school policy thinking]. *Handboek Beleidvoerend Vermogen*, 1–28.
- Verhelst, D., Vanhoof, J., Boeve-de Pauw, J., & Van Petegem, P. (2020). Building a conceptual framework for an ESD-effective school organization. *The Journal of Environmental Education*, 51(6), 400–415. <https://doi.org/10.1080/00958964.2020.1797615>
- Verhelst, D., Vanhoof, J., & Van Petegem, P. (2021). School effectiveness for education for sustainable development (ESD): What characterizes an ESD-effective school organization? *Educational Management Administration & Leadership*, <https://doi.org/10.1177/1741143220985196>
- Verhelst, D., Vanhoof, J., & Van Petegem, P. (2022). Development and validation of the education for sustainable development school organisation questionnaire. *Environmental Education Research*, 28(2), 241–259. <https://doi.org/10.1080/13504622.2021.2007219>
- Wals, A., Weakland, J., & Corcoran, P. B. (2017). Preparing for the Ecocene: Envisioning futures for environmental and sustainability education. *Japanese Journal of Environmental Education*, 26(4), 4\_71–76. [https://doi.org/10.5647/jsoee.26.4\\_71](https://doi.org/10.5647/jsoee.26.4_71)
- Witziers, B., Bosker, R. J., & Krüger, M. L. (2003). Educational leadership and student achievement: The elusive search for an association. *Educational Administration Quarterly*, 39(3), 398–425. <https://doi.org/10.1177/0013161X03253411>
- Woehr, D. J., Loignon, A. C., Schmidt, P. B., Loughry, M. L., & Ohland, M. W. (2015). Justifying aggregation with consensus-based constructs: A review and examination of cutoff values for common aggregation indices. *Organizational Research Methods*, 18(4), 704–737. <https://doi.org/10.1177/1094428115582090>