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Whole school approaches to education for sustainable development: a model that links to school improvement

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ABSTRACT
This study applies a model of school organisation developed by one of the authors to investigate school improvement processes leading to a whole school approach in Education for Sustainable Development (ESD) literature. The model is operationalized to a survey instrument and distributed to Swedish upper secondary teachers. The instrument provides empirical indications of teachers' perceptions of their schools in terms of four major dimensions of an ESD whole school approach, the importance assigned to a holistic vision, routines and structures, professional knowledge creation, and practical pedagogical work. The aims of the study are to compare the teachers' perception of their school organisation. We compare perceptions of teachers working in schools actively implementing ESD and teachers in comparable reference schools. Comparisons are also made between teachers from schools applying different strategies and quality approaches in implementing ESD. The results indicate that, relative to teachers in ordinary schools, those in ESD schools perceive their school organisations to have higher quality and coherence, with greater potential to support teaching and pedagogical work in practice. However, there is substantial variation in perceptions of teachers from different ESD schools. The model's robustness is validated by coherence of earlier results in the same schools.

Introduction

The global sustainability agenda challenges traditional pedagogies and calls for a school education that fosters awareness of the complexities and uncertainty of the surrounding world. A school organisation that promotes such changes can be regarded as reflexive in relation to social learning and new social movements (Lotz-Sisitka et al. 2015). In school improvement research, a school's organisation is commonly understood as reflexive in relation to material and time, and should provide support for students and staff. Further, the school culture should be conducive to conversation and based on ideals of student-centred approaches (Kelley and Dikkers 2016). By this definition, school improvement refers to collectively supporting factors in the organization that enhance students' possibilities for learning in relation to a complex surrounding world. Thus, the focus of learning within the organisation is a central feature in a school improvement process (Harris et al. 2013). In this study, the school organisation is defined as the human efforts and material equipment that collectively help or hinder student learning.
and has multiple perspectives, e.g. cultural, structural, political, transformational and thinking (Bolman and Deal 1991; Morgan 1997).

This study considers the nature of a school organisation equipped to meet the new demands and aligned, in terms of multiple perspectives, with the ideals mentioned above. More specifically, we use a theoretical model based on school improvement research (Scherp 2013a) to investigate and compare teachers’ perceptions of the organisations of schools that are (and are not) implementing Education for Sustainable Development (ESD) in various ways. Thus, the objective is to explore possible differences in schools' organisation associated with embracing ESD, according to perceptions of teachers working in them.

It has been theoretically suggested that the school organisation is one of the most crucial facilitators of ESD implementation in practice (Nikel and Lowe 2010; Scott 2013). However, few studies have investigated ESD implementation in relation to school organisation. In contrast, in school improvement research there is a long tradition of investigating schools at the school organisation level, and many research instruments have been developed for this purpose. Therefore, this study takes an interdisciplinary approach using a research tool drawn from school improvement research to investigate ESD implementation.

A specific goal of ESD is to improve learning that helps students become responsible individuals, thereby fostering sustainability for the sake of world equity and conservation of natural resources at local to global levels (Bourn 2008). Thus, the ESD ideal supports school improvement processes, and involves addressing both specific issues such as climate, poverty, biodiversity, and the reflexive application of appropriate methods, approaches, skills, abilities, visions and practices. The objective of this study is to identify characteristics of a school organisation that turns the ESD vision into a practical reality, and contributes to educational quality in ways defined and advocated by both policy (UNESCO 2004, 2014) and researchers (Kronlid and Lotz-Sísitka 2012; Reid, Nikel, and Scott 2006; Wals and Schwarzin 2012).

Many scholars (e.g. Hargreaves and Shirley 2009; Nikel and Lowe 2010; Mader, Scott, and Abdul Razak 2013; Scott and Gough 2003; Scott 2009, 2013; Sterling 2003) emphasise the importance of studying general qualities used in school improvement to understand characteristics of the ESD implementation process in education. These scholars argue that ESD implementation must be closely related to the schools' own quality assurance culture in education. The ESD implementation strategies discussed in this paper are therefore related to general educational qualities that have been identified as highly important in organising schools by school leaders in a previous study conducted at the same schools as investigated in this study (Mogren and Gericke 2017a, 2017b).

In this study, the school organisation is further investigated at the same schools through a teacher survey that is used to identify and compare differences in the teachers’ perceptions of their schools' organisation. This allows us to explore how different ways of organising a school relate to different ESD implementation strategies, and offer some recommendations for future ESD implementation efforts based on a framework rooted in school improvement research.

**Background**

Earlier research on ESD implementation has mainly focused on educational outcomes of students (Berglund, Gericke, and Chang Rundgren 2014; Berglund and Gericke 2015; Boeve-de Pauw and Van Peetegem 2011; McNaughton 2012; Olsson, Gericke, and Chang-Rundgren 2015; Olsson and Gericke 2016) or teacher practices (Borg et al. 2012, 2014; Bursjöö 2014; Hasslöf 2015; Sund and Wickman 2011). However, the few studies that have focused on school organisational level aspects of ESD implementation have highlighted several factors that are important in ESD implementation. The identified qualities are related to four key aspects: collaborative interaction and school improvement, student-centred education, cooperation with the local society, and proactive leadership (Mogren and Gericke 2017a). Each of these aspects represents a possible way of relating the school organisation to ESD.

Breiting, Mayer, and Mogensen (2005) identify the schools’ broad reciprocal cooperation with different stakeholders to find shared sets of values as an important aspect of ESD implementation (e.g. students’ cooperation with the local municipality in solving problems caused by acidification of ecosystems, or efforts by schools to establish contact with interest groups involved in restoration of a lake). Engagement at all levels and distributed leadership are aspects highlighted also by Leo and Wickenberg.
They claim that distributed leadership that engenders a school culture supporting initiatives and influence of both teachers and students is crucial for ESD implementation.

In addition to the cited studies, a few scholars have addressed ESD-related aspects at the school organisation level. Notably, a key finding of a British action research project called ‘Leading sustainable school research’ was that the willingness of school leaders to engage with ESD issues depends on whether ESD is understood as an additional educational perspective or a vehicle to deliver generally increased quality in education (Birney and Reed 2009; Campbell 2011). This relationship (among others) is further explored in this paper.

Since ESD has been sparsely researched at organisational level, the theoretical papers related to the ESD whole school approach (Hargreaves 2008; Henderson and Tilbury 2004; McKeown and Hopkins 2007) guided us in the process of establishing a suitable framework to study the school organisation in relation to ESD whole school approach. A whole school approach is suggested to be a comprehensive ESD approach (Hargreaves 2008) and the qualities recognised to strengthen education within it are, according to Gough (2005): coherence, appropriate policies, transparency, appropriate practice and continuing professional development.

Coherence in this context refers to the alignment between the formal curriculum and the specific ESD agenda of a school. We refer to this here as holism, in the sense of making ESD part of the ordinary school improvement process rather than an optional educational perspective. The implementation of ESD in schools’ structures and routines has been seen as a way to transform education, making it more relevant to learners and improving its match with societal needs (Sterling 2004). Policy and transparency refer to the degree to which the purpose of school practice is shared and understood at all levels in the school, i.e. by pupils, staff, parents and the community. The overall purpose of ESD is to make an educational contribution to building a sustainable society and sustainable future. Students should have opportunities to learn through practice about societal needs, and make practice-based improvements. In this study, we call this practical experience.

Continuing professional development refers to the potential of ESD to profoundly change education over time, and the associated need for corresponding training. These qualities are important parts of education in general, but are specifically highlighted as requirements for implementing ESD (Gough 2005; Hargreaves 2008; Henderson and Tilbury 2004). Therefore, we have searched for an analytical tool that is robustly rooted in school improvement theory and school effectiveness research capable of gauging these qualities.

The theory and model of school organisation we selected was developed during a decade of research by Scherp, one of the authors. It has been previously used in nationwide studies in Sweden, and is therefore adapted to the Swedish context (Scherp and Scherp 2007). The model was previously named VISKA (VardagsInriktat Systematiskt KvalitetsArbete) in Swedish, but here it is called the Scherp model or Scherp’s model after its originator.

The Scherp model builds on an analysis of the school organisation in terms of four dimensions in a similar manner to the ESD whole school approach, as further outlined below. Thus, it potentially enables determination of degrees that a given type of school organisation supports teaching and learning in a way that embraces and fosters understanding of societal changes and needs from the surrounding world. Three of the four dimensions (Holism, Routines and structures and Professional knowledge creation) are key aspects of the underlying functional structure of the school, and thus its capacity to support the fourth dimension, Practical pedagogical activities, which in turn influence students’ outcomes (Scherp 2013a).

Introduction of the school improvement model

Scherp’s model is designed to measure and facilitate analysis of relationships between a school’s organisation and the quality of its pedagogic work. The model is theoretical, and based on four constructs intended to capture fundamental aspects of the organisation’s everyday practice that are collectively regarded as the driving force of general school improvement (Figure 1). Thus, the model (which is rooted in a perspective of practitioners within schools) can be potentially used as a tool to improve schools (Scherp and Scherp 2007).
The four constructs of the Scherp's model are described as dimensions of the school organisation as follows:

- The Holism dimension refers to the degree that schools have an articulated, holistic vision of their aims concerning student outcomes, and the pedagogic methods and perspectives that should be applied to realize the vision. The construct encompasses the pattern of common understandings about learning and teaching among a school's teachers and leaders. It can be used to gauge the degree that educational priorities are aligned with an articulated school vision, priorities of the local community and the school itself. If there is no common holistic vision on a school organisation level, every issue in the school will be handled in a vacuum, rather than leading the organisation in a clear, desirable direction. Instead it will meander, go astray and respond to the latest fad. The creation of a holistic concept by each school organisation provides a way to enhance or maintain the quality of associated factors. It should be reviewed critically both by the practitioners and scientific measures. The holistic concept should also meet demands in curricular and other national steering documents, and the Holism (in the sense of the degree that a school has an articulated and strongly promoted vision and associated practices) is crucial to improvement within a school, according to (Scherp 2013a).

- The Routines and structures dimension concerns the degree to which stability and security are maintained, and teaching is protected from disturbances, through routines, scheduling, locations, and teachers' working units. It incorporates arrangements for student healthcare, staff services and evaluation. In the everyday activities it encompasses, the underlying logic is that any disturbance is related to a lack of fit between individuals and structures, rather than the structures per se. For example, if results of several students taking a study programme decline, in a strongly Routines and structures-oriented school a student counsellor at the school may suggest that the students should change their study programme, rather than structurally modifying the study programme in accordance with students' needs. Such action by a school counsellor would manifest the hierarchical logic at one end of the Routines and structures spectrum. At the other end of the spectrum, routines and structures may be rearranged to meet needs of school improvement processes. Suggestions for such changes are then often identified through application of the logic underlying the bottom-up Professional knowledge creation dimension of organisation (see below), which regards challenging hierarchical set routines and structures as a key task. There is high quality in the Routines and structures dimension when the routines and structures facilitate implementation of the school's holistic vision, and are adjusted to new learnings through interactions with factors associated with the other dimensions of school organisation.
• In terms of the Professional knowledge creation dimension, disturbances in everyday pedagogical practice are indications that the general educational (and particularly teaching) arrangements do not match changes in the outer world or community, and thus should be adapted. This may involve changes in the curriculum or local demands on school, such as an influx of students with different cultural backgrounds. Professional knowledge creation is important for developing new understanding of learning and teaching, so it is strongly linked to critical reflection in education, and understanding different values that underpin different views of reality. This requires application of a bottom-up logic of leading learning, based on experience from praxis. The results from reported experiences of learning and teaching suggest that high quality in the Professional knowledge creation dimension includes willingness to change routines and structures, e.g. through promoting peer-learning and adjusting the pedagogical work to fit students’ needs (Scherp 2013a).

In another example, production of a school magazine by a group of teachers and students in a school could become a permanent activity, and (thus) part of the school’s routines and structures. In this manner, suggestions for improvement may be evaluated within the professional knowledge creation domain, and subsequently incorporated in the organization’s routines and structures.

• The Practical pedagogical work dimension refers to the learning and teaching situation in the school. Ideally, teachers and pupils should create learning platforms together, handling situations in the learning interaction in a manner that promotes both the students’ learning of new knowledge and the teacher’s teaching ability. Scherp (2013a) argues that the teacher has a key role in structuring environments and situations for students to learn, and is helped or hindered in this by the school’s qualities in terms of the other organisational dimensions (Holism, Routines and structures, and Professional knowledge creation). If there is coherence, and high quality, in the other three dimensions, they will jointly support the practical pedagogical work, thereby enhancing student outcomes and school improvement. For example, if the scheduling (part of the routines and structures domain) is flexible in a school that holistically embraces for example ESD, a teacher may take students on an excursion to a forest in response to their interest aroused by debate in local media regarding the forest’s exploitation. Thus, factors associated with these three dimensions would enhance quality in the dimension of practical pedagogical work. Alternatively, in a school with the opposite attributes, poor knowledge creation and rigid scheduling would prevent such interest being raised, and any such excursions, in alignment with the lack of holism, resulting in poorer pedagogical work and outcomes.

**The Scherp model of school organisation as an analytical tool to study school improvement**

Scherp’s theoretical school organisation model provides a framework to describe the potential of a school organisation to promote school improvement, facilitating analysis of both the separate dimensions and their interactions. Hence, it can be used to capture two important features of a school organisation. First, the importance assigned to factors associated with each dimension provide indications of the logics underlying the school improvement strategy, or lack of such a strategy (Scherp 2013a), as a manifestation of what is understood within the logic. Bohm (1980) calls this relation between logic and strategy enfolded and unfolded order in the world around us, and argues that the unfolding strategy realises and expresses potentialities within the enfolded logics. Aspects related to every dimension of the school organisation model may help or hinder school improvement efforts, depending on the logic that is most strongly espoused in the organisation (as described in the bullet points in the previous section). The school organisation can be understood by studying the emphasis on these logics. If a school strongly embraces Holism, its strategy for qualitative school improvement will be rooted in a holistic vision, and if it prioritises (maintenance of) Routines and structures rather than Professional knowledge creation, it will lean towards hierarchical steering, and fending off impulses from the external society, etc.

Second, the coherence between the dimensions indicates the likelihood that a school improvement process will realise the school’s holistic concept (if it has one) in pedagogical work and desirable student outcomes. Moreover, measures of each dimension of the model and their coherence with measures of the other dimensions should indicate the main organisational determinants of pedagogical practice.
in a school. If the routines and structures are strongly coherent with the school’s holistic concept, the school’s organisational structures should support realization of its holistic vision. In contrast, if the holistic concept is strongly aligned with professional knowledge creation, the school organisation is probably oriented towards enabling the teachers to acquire the knowledge required to implement the holistic concept. Thus, high quality in all three dimensions of school organisation should provide synergistic support for pedagogical work, and thus strongly enhance school improvement efforts (Scherp 2013a).

In this study, we use the Scherp model to analyse these two aspects of school organisation, i.e. the importance assigned to the underlying logic and factors associated with each of the dimensions in the organisation, and second their coherence. This enables assessment of teachers’ perceptions of the logic and quality of their school organisation. Data on these perceptions can also be used to unfold the potential success of different ESD implementation strategies by comparing the organisations of schools following different strategies. For these purposes, we used a survey instrument that operationalises each dimension of the Scherp model and relations between the dimensions, as described in the Method section. The instrument was distributed to teachers working in ESD-active schools and others working in reference schools that had not explicitly adopted an ESD approach. The survey data are used to elucidate teachers’ perceptions of their own schools’ organisations in order to assess relationships among the dimensions, active implementation of an ESD approach and promotion of a fruitful school improvement strategy. Justifications for this research design are presented in the next section.

**Rationale for using the Scherp model in ESD-implementation research**

In this section, we elaborate and describe ways in which the dimensions of Scherp’s model reflect the putatively important qualities in the ESD whole school approach.

In the ESD whole school approach, a holistic concept has claimed importance at all levels and in all parts of the school organisation (Gough 2005), as it can help to ensure that ‘curriculum, programs, practices, and policies of an educational institution are engaged to contribute to building a more sustainable future. In this approach, sustainability is lived as well as taught’ (McKeown and Hopkins 2007, 22). In the Scherp model, quality in the school organisation is defined by the degree to which actors in the school (school leaders, teachers, students) are motivated by a holistic concept embracing the previously described organisational routines and structure, professional knowledge creation and practical pedagogic work (Scherp 2013a). The holistic concept is the most essential element, as it influences all other aspects (Figure 1), and thus is the primary connection between the Scherp’s model and ESD whole school approach.

The practitioner perspective, the second component combining a whole school approach to the Scherp’s model is grounded in research that suggests that ESD and its implementation should be based on praxis (Breiting, Mayer, and Mogensen 2005; Nikel and Lowe 2010; Pigozzi 2007). Many scholars claim that ESD should be implemented through generic qualities and not be limited to ESD topics and teaching practices only (Mogensen and Schnack 2010; Scott and Gough 2003; Scott 2013; Vare and Scott 2007). The Scherp model is, in this study, used to empirically investigate school organisations through teachers’ perceptions of school improvement based on their practical experience and their own concerns in general.

The specific definition of education is the third component of a whole school approach that links to the Scherp model. Education may be considered any experience that has a formative effect on the way one thinks, feels, or acts (Biesta 2015). The Scherp model reflects an understanding of education similar to that of Marton et al. (1999), who suggest that education should equip learners with the ability to reflect on what is relevant knowledge. Biesta (2015) and Jickling and Wals (2012) similarly argue that education is not only a matter of receiving professional knowledge of already known practices but should provide the learners with a sense of responsibility and freedom to actively change future society. The Scherp model is therefore developed to clearly reflect any progress of change in educational practice. The demands on ESD to primarily effect change in education and secondarily in society (Scott 2013) and can only be understood through a model that can reveal a progression in school improvement towards change and regeneration.
To summarise, the Scherp model is suitable for our study because it combines the two most relevant research fields (school improvement and ESD research) and it is also sensitive to the key quality parameters of school organisation, and particularly efforts to raise the quality of education through an ESD whole school approach.

**School improvement processes promoting ESD implementation**

There are numerous initiatives to implement ESD both internationally and in the Swedish school system (Breiting and Wickenberg 2010; Reid, Nikel, and Scott 2006). An intention in this study is to mirror the plurality in order to investigate and compare whether the school organisations differs depending on the kind of school improvement processes that are used in ESD active schools. This section describes the processes used to implement ESD in the context of the study, and how they have been used as the basis for selecting and classifying schools.

Two parameters were used for classifying schools with potentially different improvement processes: the ESD implementation strategies used by the schools, and the general quality approaches guiding the school leaders in ESD-active schools identified in a previous study (Mogren and Gericke 2017a, 2017b). Theoretical and empirical justifications for choosing these two parameters are provided below.

**ESD implementation strategies**

The Swedish curricula include ESD (Borg et al. 2014; Östman and Östman 2013), but do not state how it should be implemented, although there are multiple ways of implementing it, which often correspond to different ways of defining quality (Nikel and Lowe 2010). In the Swedish context, this is very important as the principles of decentralization and new public management have guided school improvement efforts during the last two decades, so such efforts often have diverse outcomes at a local level (Jarl, Andersson, and Blossing 2017). However, a main dividing line is whether quality efforts should be implemented hierarchically, i.e. top-down and then transferred into the organisation, or in a praxis-oriented manner, spreading ideas by networking bottom-up (Holmberg et al. 2012). Thus, schools were selected for the study that held an ‘ESD award’ and/or participated in a ‘national interdisciplinary network of ESD schools’, as they were respectively regarded as being likely examples of schools adopting top-down and praxis-oriented ESD implementation approaches.

Evans (2015) has shown that the local motives for schools to participate in the Swedish ESD award systems are: political (pressure from political decisions taken outside school), symbolic (some schools want to use the flag or symbol provided by the award), personal (in some cases an individual or group within the school is interested), institutional (some schools want to use teaching materials provided in the award system). According to Evans (2015) the identified categories relate mostly to extrinsic motives, concluding that: ‘the motive is for approval from others or for a feeling of self-worth/measurement rather than congruence with the values of the award’ (91). Hence, according to Evans there is a lack of intrinsic motivations and usually ESD implementation efforts in the award schools are driven top-down. Previous nationwide evaluations of ESD award schools have found little or no effects on student outcomes, supporting this claim in the sense that the implementation does not appear to reach (or have detectable influence in) the classroom (Berglund, Gericke, and Chang Rundgren 2014; Olsson and Gericke 2016).

An interdisciplinary approach is an intrinsic ESD quality, clearly implying a transformative and practice-based implementation strategy rather than a top-down approach according to Breiting, Mayer, and Mogensen (2005). Holmberg et al. (2012) found that this strategy relates to the development over time involving a wide range of individuals in ESD. Thus, we believe there are sound empirical and theoretical foundations for choosing these ESD strategies (which are described below). However, the strategies often co-exist within a school organization, and there may be various hybrids, so our criteria only provide a rough way to capture the variation in ESD implementation strategies that might be deployed or evolve.

- **An ESD Award implementation strategy** is adapted to school improvement in a hierarchical school organisation with clear goals (Holmberg et al. 2012). Holmberg and colleagues claim that a hierarchical setting provides a reliable way to progress towards predefined goals, but might be less successful in engaging all individuals in the organisation. The word award symbolises efforts to
meet pre-decided criteria. A specific characteristic of schools with this type of approach is use of performance assessments of the educational processes to reach the goals by external stakeholders. Programmes led by ESD award implementation organisations, e.g. the Foundation for Environmental Education in Europe (2016), focus on teacher and student activities. In the Swedish context, the management level is mainly part of the administrative procedure for the Green Flag Award (Håll Sverige rent Grön Flagg 2015). The Swedish National Agency for Education (2015) is another Swedish national programme for ESD implementation. The programme involves challenges at teacher, student and organisation levels, and the goal of the programme is to ensure that: ‘The school is organised so that all students and staff are given the possibility to actively work for a sustainable future’ (SKOLFS 2009 retrieved May 13 2014). The presented award programmes have similarities with top-down school improvement in the emphasis on set goals, student and teacher activities, reporting, and effective ESD implementation (see Evans 2015).

- An ESD Interdisciplinary implementation strategy is a school improvement process that is not based on pre-defined best practices, but on processes of continuous change. The term interdisciplinary refers here to the creation of cross-subject and cross-grade platforms. In this study, a national Swedish network of upper secondary schools interested in implementing interdisciplinary teaching over time was approached. For several years, members of the network (often teams of teachers and school leaders) have regularly met, exchanged practical experiences, and visited each other’s schools to develop their interdisciplinary practices (oral communication with school leaders participating in the network). Holmberg et al. (2012) claim that an interdisciplinary ESD teaching approach is related to gradually increasing involvement of a wide range of individuals in the organisation. The importance of the organisational level is highlighted in documents describing ESD interdisciplinary implementation programs, for example, the MUVIN project (Breiting 1994; Breiting and Wickenberg 2010). In an evaluation of the MUVIN programme, quality criteria including school cooperation with society and a visionary leadership style were found to be particularly important at the school management level (Breiting, Mayer, and Mogensen 2005). At a practical level, the expected student outcome for the interdisciplinary implementation strategy leans towards development of skills and competences such as decision-making, argumentation and reflection (Breiting 1994; Breiting and Wickenberg 2010).

**General quality approaches**

In an earlier study (Mogren and Gericke 2017a, 2017b) we found that leaders of both types of ESD-active schools (award and interdisciplinary) covered in this study used different general quality approaches. Hence, the approaches were not directly associated with these types, but were related to other factors. We therefore decided to include these seemingly independent factors, ESD implementation strategies and general quality approaches, as parameters for identifying different school improvement processes. The general quality approaches are briefly described in the following text.

The general quality approaches refer to the ways the school leaders strive to provide high quality education overall, not only in terms of ESD. Previous authors have discussed the premise that various educational qualities generally affect ESD implementation (e.g. Nikel and Lowe 2010; Scott and Gough 2003; Scott 2013), and suggested that ESD should be studied through the lenses of a general education perspective (Andreotti 2010; Breidlid 2009; Breiting, Mayer, and Mogensen 2005; Wickenberg 2006). They argue that most advantages of the ESD school improvement process lie in the combination, reshaping and creation of general school improvement qualities. Therefore, it is important to include this parameter when studying ESD implementation.

Previous cluster analysis of general quality approaches adopted by school leaders in ESD-active schools has revealed three distinct approaches. Some schools focus mainly on quality criteria related to the inner life of the school, e.g. collaborative interaction, school improvement and student-centred learning in education. We call this an internal quality approach. A second group of schools focus on qualities related to the surrounding school society to give ‘authenticity’ to the development of their school organisation. Thus, the ability of the school leaders to cooperate with local society and engage with other external groups and issues is critical, and we call this an external quality approach. Finally,
the cluster analysis identified one school that based its activities on both of these main general quality approaches, simultaneously and in combination. This school paid close attention to student-centred learning activities, and strongly cooperated with the local society through proactive leadership. We call this quality approach, which is explained in detail in a previous paper (Mogren and Gericke 2017b), a combined internal and external quality approach.

The relationship between internal and external school improvement has been discussed by Edwards Groves and Rönnerman (2013). Drawing on professional learning, they relate the ‘internal’ to the personal will and desire to contribute, and the ‘external’ to the physical and contextual impact to support learning and education (p.129). Hence, in an ESD context the teachers’ motivation and ideas of what they want to achieve in relation to ESD can be described as the internal factors of school improvement, while physical constraints such as their school’s location, parents’ interest and support from senior staff are external factors. Liljenberg (2015) also concludes that ‘internal’ and ‘external’ factors are mutually dependent, and discusses ‘coupling agents’ that connect internal and external school improvement factors within the school organisation.

The description of external quality factors in the field of school improvement research differs from those described in ESD research, which are related to outside stakeholders, trends and demands on schools in a reciprocal process (Wals and Schwarzin 2012). Hence, in ESD discourse the drivers of externally mediated improvement are mutual relationships with elements of the surrounding society, and (in contrast to the common treatment of external quality in school improvement literature) not directly connected to physical conditions of the school (Björkman 2008). In this paper, we use the terms ‘internal’ and ‘external’ essentially in line with the ESD discourse.

In the Method section, we elaborate how we have used the ESD implementation strategies and general quality approaches to categorise the investigated schools in terms of several possible improvement processes in ESD-active schools.

**Aims of the study and research questions**

The study aims to investigate and compare teachers’ perceptions of their school organisations in non-ESD (reference) schools and ESD-active schools, and among categories of ESD-active schools that have adopted different improvement strategies (classified according to their ESD implementation strategies and general quality approach). Characteristic features of these school organisations are investigated in terms of Scherp’s model. Based on the analysis, the ways that the different school improvement processes can promote or hinder the ESD implementation process are discussed. Using the Scherp model as an analytical tool, the following specific research questions regarding teachers’ perceptions of their school organisations are addressed:

1. Does the school organisation differ between ESD-active schools and reference schools?
2. Does the school organisation differ between ESD-active schools using award certification and interdisciplinary networking ESD implementation strategies?
3. Does the school organisation differ between schools using different general quality approaches (internal, external or a combination of both)?
4. How does the school organisation differ between schools in which ESD implementation strategies and general quality approaches are combined in different permutations?

**Method**

Our research design is deductive since the study is based on a theoretical model describing the function of the school organisation. Empirical data for the study were obtained using a quantitative questionnaire designed to elicit teachers’ perceptions of their school organisation to investigate ESD implementation processes. Descriptive statistics were used to compare the perceptions of teachers working in ESD-active schools recognised as adopting different improvement processes and the perceptions of teachers working in comparable reference schools. The study can be regarded as an exploratory
case study as we investigate teachers’ perceptions related to school improvement processes at a small sample of ESD-active schools. This was deemed an appropriate approach, as an exploratory case study ‘can “close-in” on real-life situations and test views directly in relation to phenomena as they unfold in practice’ (Flyvbjerg 2011, 309).

In the survey, teams of teachers in the ESD-active schools (n = 8–20), in which we previously investigated the school leaders’ quality work (Mogren and Gericke 2017a, 2017b), answered questions about their understanding of their school organisation's priorities. The survey instrument was originally developed to operationalise and measure teachers’ perceptions of their school organisation in terms of the dimensions included in Scherp’s theoretical model (Scherp and Scherp 2007). The findings were expected to reveal important priorities in the school organisation as experienced by the teachers. In the following text we describe in consecutive order: the selection of schools, data collection, the survey instrument used and finally, the four conducted analyses.

Selection of schools

To capture and compare different school improvement processes we used two parameters (ESD implementation strategies and general quality approaches) to classify and group schools. The rationale for this is described in the theoretical background.

Selecting the award schools

To identify award schools (i.e. schools implementing ESD with an award-based strategy), we first examined entries in the Award for Sustainable Development (The Swedish National Agency for Education, 2015), Green Flag Award (Håll Sverige rent Grön Flagg 2015) and The Global School program (Swedish Council for Higher Education 2014) national registers. These registers contain names of schools certified by the only two national ESD programmes for schools in Sweden, and one governmental ESD school programme. The three organisations that oversee these programmes support Swedish schools’ ESD implementation efforts and their registers are the only national databases on schools involved in ESD activities in the Swedish formal school sector (Berglund, Gericke, and Chang Rundgren 2014).

Based on the ESD certification programmes and registers, a ranked list was compiled of the upper secondary schools that were considered to have the most convincing ESD implementation activity in Sweden. The ESD-activity of schools was related to evaluation criteria and used as the basis for selecting schools. The criteria were (in order of importance for evaluation): (a) the time that the school had participated in the award system; (b) the relative number of participants (due to total amount of staff) from the school that have participated in ESD-related activities and the rate of frequency; (c) documentation of the school’s work on ESD; (d) the school principal’s activity in applying for awards and participating in ESD-activities. The seven most highly-ranked schools were selected as our ‘award schools’ and contacted. Each school verified its ESD engagement by verbal contact, and the information was finally verified by local ESD stakeholders (e.g. representatives of non-governmental organisations involved in ESD support programmes for Swedish schools) that had insight about the school.

Selecting the interdisciplinary networking schools

The second group of ESD-active schools consisted of three schools that were engaged in a network interested in implementing interdisciplinary ESD. The network, its activities and the rationale for selecting the schools is described in the background section. Local stakeholders verified, in the same manner as for the ESD-award schools, that all the schools in the second selection group work with ESD implementation in an interdisciplinary manner.

When the data collection process started, two of the seven selected award schools were also found to belong to the network and shared interest in interdisciplinary education, thus they appeared to apply both hierarchical and bottom-up approaches. Therefore, these schools are separately addressed to assess the possible impact of their dual approach on the teacher-perceived understanding of their improvement processes (see Analysis 2, below).
Of the 10 selected schools, two chose not to participate in this study, although they had previously participated in the studies regarding school leaders. This was because their teachers had heavy workloads and were under high pressure when the survey was distributed, in late spring 2013 (the end of the semester). The study is therefore based on responses of teachers at eight ESD-active schools: three ESD award schools, three ESD networking schools and two schools with a dual commitment.

Selecting the reference schools
At the same time (2013) that we collected data from the ESD-active schools, we also collected data from a nationwide sample of Swedish teachers in regular upper secondary schools, i.e. schools that had not expressly committed to any specific ESD approach. The questionnaire was sent to 12 schools that had previously participated in different in-service training programmes unrelated to ESD.

Data collection
The teachers from the eight ESD-active schools that participated in this study are the most active teams of teachers working with ESD at these schools according to their school leaders. In total, 263 teachers participated: 58 from the eight ESD-active schools (8–20 per school) and 205 from the 12 reference schools. All the schools in the study had teacher teams organised around students (a common arrangement in Sweden). Thus, the participating teachers were closely connected to the daily school work and taught diverse subjects, such as Swedish, social sciences, foreign languages, mathematics and science. We have not attempted to explore differences in perceptions among teachers of different subjects since the groups are too small, and teachers in Swedish upper secondary school normally teach two subjects. The teachers responded individually to a paper questionnaire designed to operationalise the Scherp model, as described in the next section.

The survey instrument
The items in the existing survey tool being used in this study was constructed to cover variables reflecting the teachers’ perceived emphasis in their schools on the underlying logic and factors associated with three of the dimensions of the Scherp model (Holism, Routine and structures and Professional knowledge creation) and the coherence between the dimensions. The content and item validity of the questionnaire have been confirmed by data collected from previous studies in the same Swedish context (Scherp 2013a; Scherp and Scherp 2007). Data, variables and results were presented and discussed at recurrent validation conferences with teachers and school leaders during the piloting. The results of several studies were also tested against the perceived reality of teachers and school leaders by triangulation with other methods, including interviews and observations. The entire teacher survey, its background, earlier use and the theory it is based upon are described in detail by Scherp and Scherp (2007) and Scherp (2013b).

The survey was originally developed to cover a wide range of school improvement phenomena. In this study, however, only the items related to the Scherp model (Scherp and Scherp 2007) are used. Moreover, the construct validity of the variables used to probe the emphasis on each dimension in the Scherp model were empirically verified in this study through hierarchical cluster analysis of responses to all the items related to the dimensions in the Scherp model (Messick 1995). As shown in Table 1, this resulted in the identification of three, three and six items, respectively, covering the Holism dimension (H-items), Routines and structures dimension (RS-items), and Professional knowledge creation dimension (PKC-items). More items were used to cover the Professional knowledge creation dimension because the survey was originally developed to explore this dimension most intensively.

In addition, five items were used to assess the dimensional coherence of the school organisation: one directly related to the Practical pedagogical (PP) dimension, two covering the coherence between the Professional knowledge creation and Routines and structures dimensions (PKC-RS), one covering the coherence between the Holism and Routines and structures dimensions (H-RS), and one covering the
coherence between the Holism and Professional knowledge creation dimensions (H-PKC). These five items together form a variable that measures the overall holistic coherence in the school organisation (C), see Tables 1 and 3. In this study we are also interested in how the dimensions relate to each other. Thus, we also examined the coherence between pairs of the dimensions (see Figures 2–5).

All items in the survey are based on the 1–4 Likert scale (1 = disagree, 2 = partly disagree, 3 = partly agree, 4 = totally agree) in which a high score indicates that the dimension is emphasised (H, RS and PKC items), or that the dimensions are coherent (H-PP, H-RS, H-PKC and RS-PKC).

After the data were collected, the variables covered by at least three items were subjected to a reliability test (Cronbach’s α). Cronbach’s α values for the H-, RS- and PKC-items were 0.73, 0.74 and 0.78, respectively, and the value for the variable measuring overall holistic quality (C) in the Scherp model (formed from H-PP, RS-PKC, H-RS and H-PKC items) was 0.77. Thus, the values were consistently higher than the threshold Cronbach α value (0.7) for acceptable reliability according to Field (2013). Few items were used for investigating the coherence of pairs of dimensions in this study (one or two), which greatly reduces the robustness and meaningfulness of reliability measures such as Cronbach’s α (thus values are not reported for them).

The acquired data generated regarding each variable and school improvement process are not sufficiently robust to claim that the study could be regarded as a rigorous psychometric investigation. Instead, it is an exploratory case study based on quantitative methodology. The results provide indications of tendencies, derived from mean values of the Likert-type responses, with values ranging from
1 to 4 (see Table 3). Nevertheless, results for the model as a whole provide substantial information regarding each addressed dimension and their coherence.

In addition, statistical analysis using the Statistical Package for the Social Sciences (SPSS) version 20 was also conducted to compare mean values for the variables H, RS, PKC and C. Paired Samples T-test was used for research question 1 and one-way ANOVAs for research questions 2–4. In cases of significant differences in the ANOVAs, we performed post hoc tests (Tukey’s HSD) to identify which means significantly differed from one another. However, Power analysis indicated that the sample sizes 2–4 were too small to detect differences between the groups. Hence, also in comparisons no differences were found in this study. However, differences might appear in studies using larger sample sizes. Visualisations of the results in Figures 2–5 illustrate the teachers’ perceptions of their schools’ emphasis on the underlying logic and factors associated with each of the dimensions (the magnitude of the mean values is indicated by the relative sizes of the circles, and the coherence of the school organisation by the overlap of the circles in the model within each figure). The more the dimensions’ overlap, the greater the synergy in dimensions of the school organisation and (hence) support for the practical pedagogical work. As discussed below, the results indicate some interesting tendencies that warrant more detailed investigation in a larger scale follow-up study.

The four comparative analyses

The selected schools (described above) were categorised in terms of ESD implementation strategies (award, interdisciplinary or combined) and general quality approaches (internal, external or combined) that could influence school improvement processes, and their organisations were evaluated in the following four comparative analyses.

1. In the first analysis, we compared all the teachers in the selected ESD-active schools with all the teachers in the reference schools.
2. In the second analysis, we compared the selected ESD-active schools that adopted the award, interdisciplinary and combined types of ESD implementation.
3. In the third analysis, we compared the selected ESD-active schools that applied internal, external and both quality approaches in their school improvement process.
4. In the fourth analysis, we compared schools with four permutations of ESD implementation strategies (award and interdisciplinary networking) and general quality approaches (internal, external or combined) that could lead to distinct ESD-oriented school improvement processes (see Table 2).

Table 2. Permutations of ESD implementation strategies and quality approaches, numbers of schools in our sample adopting them, and numbers of participating teachers (n) from the schools.

<table>
<thead>
<tr>
<th>Award-based ESD implementation strategy</th>
<th>Interdisciplinary ESD strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal quality approach</td>
<td>Permutation A</td>
</tr>
<tr>
<td>3 schools n=20</td>
<td>2 schools n=8</td>
</tr>
<tr>
<td>External quality approach</td>
<td>Permutation B</td>
</tr>
<tr>
<td></td>
<td>2 schools n=12</td>
</tr>
<tr>
<td>Combined internal and external quality</td>
<td>Permutation D</td>
</tr>
<tr>
<td>approach</td>
<td>1 school n=13</td>
</tr>
</tbody>
</table>

*The schools representing this category declined participation in the study; **No schools representing this category were found in the sample.

Results

Characteristics of the school organisations compared in the four analyses

In Table 3, we show mean values of the seven variables constructed to operationalise the Scherp model, i.e. the schools’ prioritisation of the underlying logic and factors associated with the three dimensions
Table 3. Sets of schools with varying improvement processes were compared, in four analyses, based on teachers’ perceptions of their organisations in terms of the Scherp’s model.

<table>
<thead>
<tr>
<th>Compared groups of schools in the four analyses</th>
<th>Numbers of schools and teachers (n) in the compared groups</th>
<th>Dimension of Holism (H)</th>
<th>Dimension of Professional knowledge creation (PKC)</th>
<th>Dimension of Routines and structures (RS)</th>
<th>Overall holistic coherence in the school organisation (C)</th>
<th>Coherence of Holism and Routines and structures dimensions (H-RS)</th>
<th>Coherence of Holism and Professional knowledge creation dimensions (H-PKC)</th>
<th>Coherence of Routines and structures and Professional knowledge creation dimensions (RS-PKC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis 1: Comparison of reference schools and ESD-active schools.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All included ESD schools</td>
<td>8 schools (n = 53)</td>
<td>3.52</td>
<td>2.57</td>
<td>3.00</td>
<td>2.82</td>
<td>3.11</td>
<td>3.14</td>
<td>2.57</td>
</tr>
<tr>
<td>Reference schools</td>
<td>12 schools (n = 205)</td>
<td>3.20</td>
<td>2.41</td>
<td>2.46</td>
<td>2.28</td>
<td>2.87</td>
<td>2.89</td>
<td>2.24</td>
</tr>
<tr>
<td>Analysis 2: Comparison of schools with award-based, interdisciplinary and combined ESD implementation strategies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Award schools</td>
<td>3 schools (n = 20)</td>
<td>3.12</td>
<td>2.20</td>
<td>2.89</td>
<td>2.44</td>
<td>3.00</td>
<td>2.80</td>
<td>2.35</td>
</tr>
<tr>
<td>Interdisciplinary schools</td>
<td>3 schools (n = 16)</td>
<td>3.39</td>
<td>2.75</td>
<td>2.61</td>
<td>2.68</td>
<td>2.43</td>
<td>3.07</td>
<td>2.50</td>
</tr>
<tr>
<td>Combined award and interdisciplinary schools</td>
<td>2 schools (n = 17)</td>
<td>3.75</td>
<td>2.83</td>
<td>3.49</td>
<td>3.33</td>
<td>3.71</td>
<td>3.29</td>
<td>2.87</td>
</tr>
<tr>
<td>Analysis 3: Comparison of schools with internal, external and combined general quality approaches.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal quality approach</td>
<td>5 schools (n = 28)</td>
<td>3.38</td>
<td>2.38</td>
<td>2.90</td>
<td>2.61</td>
<td>3.15</td>
<td>3.15</td>
<td>2.38</td>
</tr>
<tr>
<td>External quality approach</td>
<td>2 schools (n = 12)</td>
<td>3.30</td>
<td>2.66</td>
<td>2.60</td>
<td>2.63</td>
<td>2.30</td>
<td>3.00</td>
<td>2.50</td>
</tr>
<tr>
<td>Combined internal and external quality approach</td>
<td>1 school (n = 13)</td>
<td>3.83</td>
<td>2.92</td>
<td>3.59</td>
<td>3.40</td>
<td>3.69</td>
<td>3.23</td>
<td>3.04</td>
</tr>
<tr>
<td>Analysis 4: Comparison of schools with different improvement processes (Permutations A-D).</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Internal general quality approach and award-based ESD implementation strategy</td>
<td>Permutation A</td>
<td>3 schools (n = 20)</td>
<td>3.12</td>
<td>2.20</td>
<td>2.90</td>
<td>2.44</td>
<td>3.00</td>
<td>2.80</td>
</tr>
<tr>
<td>External general quality approach and interdisciplinary ESD implementation strategy</td>
<td>Permutation B</td>
<td>2 schools (n = 12)</td>
<td>3.30</td>
<td>2.66</td>
<td>2.60</td>
<td>2.63</td>
<td>2.30</td>
<td>3.00</td>
</tr>
<tr>
<td>Internal general quality approach and interdisciplinary ESD implementation strategy</td>
<td>Permutation C</td>
<td>2 schools (n = 8)</td>
<td>3.55</td>
<td>2.79</td>
<td>2.92</td>
<td>2.96</td>
<td>3.25</td>
<td>3.38</td>
</tr>
<tr>
<td>Internal and external general quality approach and award and interdisciplinary ESD implementation strategy</td>
<td>Permutation D</td>
<td>1 school (n = 13)</td>
<td>3.83</td>
<td>2.92</td>
<td>3.59</td>
<td>3.40</td>
<td>3.69</td>
<td>3.23</td>
</tr>
</tbody>
</table>

Notes: The presented values are mean Likert scores obtained from teachers’ responses to the items in the questionnaire.
(H, RS and PKC), the overall coherence of the school organisation (C), and the paired coherence variables (H-RS, H-PKC, RS-PKC). In the following four sections, we describe differences in teachers’ perceptions of the school organisations compared in the four analyses, and provide a graphic representation of the teachers’ perceptions.

**Comparison of ESD-active schools and reference schools**

A significant difference in the dimension *Holism* was detected between the ESD-active and reference schools (mean Likert scores: 3.52 and 3.20, respectively, $p < 0.01$: Table 3, Analysis 1). Thus, the ESD-active schools seem to be more guided by a holistic vision than schools generally, according to the teachers’ views. The results also show that teachers of ESD-active schools rate organisations of their schools more highly in terms of both the *Routine and structures* and *Professional knowledge creation* dimensions (Table 3, Analysis 1, and Figure 2).

A significant difference was found in the mean scores for the overall coherence variable (C): 2.82 versus 2.28 ($p < 0.01$), and this is reflected in scores for all the pairwise coherence variables (Table 3, Analysis 1). Interestingly, *Routines and structures* was also scored higher by teachers in the ESD-active schools, but they also scored its coherence with the *Holism* and *Professional knowledge creation* higher than their colleagues in ordinary schools. Thus, the routines and structures, and other probed organisational elements of the ESD-active schools appear to provide a stronger support for practical pedagogical work than those in the ordinary schools (according to the participating teachers).

![Reference schools vs. ESD active schools](image)

**Comparison of schools with different ESD implementation strategies**

Turning to the comparison of schools with different ESD implementation strategies, the results seem to support the theoretical expectations. The teachers in ESD award strategy schools assigned their schools higher scores for the *Routines and structures* dimension than teachers at the interdisciplinary schools, who assigned their schools significantly higher scores in both the *Professional knowledge creation* and *Holism* dimensions ($p < 0.05$, Table 3). The interdisciplinary schools were also given higher mean values for all coherence variables, except for the coherence between *Holism* and *Routine and structures*, which was assigned higher mean scores by teachers in the ESD award strategy schools (3.00 versus 2.43; Table 3, Analysis 2 and Figure 3). These results indicate that ESD award schools have a stronger focus on internal organisation, according to the teachers.

The schools that adopted a combined award and interdisciplinary strategy outperformed both of the other two categories, as their teachers assigned their organisations higher mean scores in all three dimensions and the coherence of the dimensions (see Figure 3). The mean value differences for the variables H, PKC and C were significant ($p < 0.05$). A caveat is that this pattern is largely due to the high scores obtained for one school, as discussed in the two following sections.
The comparison of ESD-active schools in which the leaders adopted different general quality approaches provided interesting results. Teachers’ at schools with an external approach on school leader level, based on societal collaboration, were assigned higher mean scores for **Professional knowledge creation** than schools with an internal approach (2.66 and 2.38, respectively). This is consistent with theoretical expectations, since the basis of this approach is to respond to changes in the wider community, which requires extension of professional knowledge (Table 3, Analysis 3). Conversely, schools with an internal approach were assigned higher mean scores by their teachers for the **Routines and structures** dimension than schools with an external approach (2.90 and 2.60, respectively). The teachers in schools following internal quality approaches also recognized higher coherence between the **Routines and structures** and **Holism** dimensions (Figure 4). Hence, the results support the validity of the Scherp model. However, there was almost no difference between schools with internal and external general quality approaches in **Holism** scores (Table 3, Analysis 3).

Perhaps the most interesting result, as clearly shown in Figure 4, is that the coherence scores were markedly higher for the school organisation with a leadership that combined both internal and external quality approaches than for those that adopted either internal or external quality approaches alone.
Comparison of schools with different improvement processes

Finally, results of the comparison of teachers' perceptions at schools with various permutations of ESD implementation strategies and general quality approaches indicated gradient-like differences in effects on school improvement processes (Figure 5 and Table 3, Analysis 4). In schools with an internal quality approach and ESD award implementation strategy (designated Permutation A) teachers assigned a higher mean score for the Routines and structures dimension than teachers in reference schools, but the reference schools received a higher mean score from their teachers for overall coherence of the school organisation. In schools with an external quality approach and interdisciplinary ESD implementation strategy (Permutation B) teachers assigned a higher mean score than reference schools for all except one variable (coherence between the Holism and Routines and structures dimensions). They also received higher scores than Permutation A schools for all variables except the Routines and structures dimension and the coherence between Holism and Routines and structures dimensions. Schools with an internal quality approach and interdisciplinary ESD implementation strategy (Permutation C) received consistently higher scores than Permutation B schools for all variables except coherence between Routines and structures and Professional Knowledge Creation. Lastly, in the school that combined internal and external quality approaches together with award and interdisciplinary ESD implementation strategies (Permutation D) the teachers' scored more highly for all variables except coherence between Holism and Professional Knowledge Creation than Permutation C schools. The differences for the variables Holism and Professional knowledge development between Permutation D and A were statistically significant ($p < 0.01$).

Conclusions

Regarding the first research question (Does the school organisation differ between ESD-active schools and reference schools?), our results indicate that ESD-active schools, as a designated group generally have higher quality school improvement processes and more coherent organisations with greater potential to support practical teaching and pedagogical work than ordinary schools (according to participating teachers). However, there is substantial variation in results among the ESD schools, so this conclusion must be cautiously generalised (especially given the small sample of ESD-active schools).

Regarding the second research question (Does the school organisation differ between ESD-active schools using award certification and interdisciplinary networking ESD implementation strategies?)
organisations of schools adopting interdisciplinary ESD implementation strategies seem to have a stronger orientation towards professional knowledge creation, than schools adopting ESD award implementation strategies, which rely more strongly on routines and structures. Generally, the schools with an interdisciplinary ESD strategy appear to have a stronger organisational coherence than the award schools, indicating that a holistic vision is more integrated in their organisations, as recommended in a whole school approach.

The third research question, Does the school organisation differ between schools using different general quality approaches (internal, external or a combination of both?), in terms of supporting ESD implementation cannot be conclusively answered. To some degree this is due to missing data from two schools. However, schools with an internal quality approach tended to receive higher scores from their teachers for coherence between the Holism and other dimensions than schools with an external quality approach.

However, we obtained interesting results regarding research question four (How does the school organization differ between schools in which ESD implementation strategies and general quality approaches are combined in different permutations?). The permutation of combined external and internal quality approaches together with combined award and interdisciplinary ESD implementation strategies (Permutation D) was associated with the highest measured coherent school organisation. This suggests that pluralistic perspectives at the school organisation level could be advantageous for high quality ESD implementation. Moreover, the integrated quality approaches are probably the most important contributors to the outstanding results for the school with Permutation D, because the high scores obtained for the combined award and interdisciplinary schools in Analysis 2 are solely due to results for this school.

Discussion

Having considered the implications of our results for the specific research questions, in this section we consider their implications regarding characteristic organisational features of a school with a comprehensive ESD implementation strategy, and the organisational effects of adopting different ESD implementation strategies and general quality approaches.

ESD implementation strategies and their influence on the school organisation

The school leaders in the investigated ESD-active schools strongly emphasised that implementation of a common holistic vision is the most important quality criteria (Mogren and Gericke 2017a, 2017b). Accordingly, our results show that teachers of the ESD-active schools also recognized a holistic vision and its implementation in the evaluation, planning and execution of teaching, integrated within the Routines and structures and Professional knowledge creation dimensions (Figure 2). These results indicate that ESD is understood and implemented in Swedish schools, particularly in those using interdisciplinary implementation strategies, in the broad and generic way recommended in the whole school approach (Gough 2005). However, it should be noted that the reference schools and ESD award schools, which received lower scores for the holistic elements of their organisational structures, might still address ESD aspects holistically in classroom teaching, in the sense of integrating ecological, economic and social aspects. This was not a focus of the study.

Moreover, greater importance was apparently attached to professional knowledge creation in schools with an interdisciplinary ESD strategy than in the reference schools, indicating that they had more transformative praxis-oriented organisations, incorporating aspects such as pluralism, collegial learning and student-centred approaches. According to Hargreaves (2008), all individuals on all levels of a school are important as catalysts for ESD action and progress. This may at least partly explain why the overall school improvement scores were higher for schools with an interdisciplinary implementation strategy than for the schools with an award ESD strategy, as the ESD certification process can be managed by one or a few people, but not implementation of an interdisciplinary strategy.
As concluded by Evans (2015, 97) regarding the Swedish ESD award certification schemes: ‘application motives driven by an external regulation, although providing an ability to develop quick widespread implementation of top-down values may lead to a potentially weak commitment of local schools to the long-term development and support of ESD awards’. Our results support this conclusion, and it seems that this organisational approach provides less support to pedagogic activities. Thus, a more praxis-oriented, bottom-up process is apparently needed for optimal transformation in the school organisation dimensions of Routines and structures and Professional knowledge creation, as in Permutations B-D (Figure 5). This is an important finding since ESD is frequently implemented via award systems in Sweden, and a great deal of effort is put into them (Evans 2015; Östman and Östman 2013). Moreover, the results are corroborated by our previous findings that the award schemes may have very minor effects on students’ outcomes in terms of sustainability consciousness (Berglund, Gericke, and Chang Rundgren 2014; Olsson, Gericke and Chang Rundgren 2016), or even negative effects (Olsson and Gericke 2016). Recently, we have also shown that students in schools adopting an award strategy have very limited experience of ESD teaching that incorporates holistic and pluralistic approaches (Boeve de Pauw et al. 2015). Our results are consistent with these findings, and suggest that some schools may seek certification more as a label of merit rather than as a means to promote real transformative changes at the organisation level.

An interesting result is that the schools that adopted an interdisciplinary, praxis-orientation ESD implementation strategy (Permutations B, C and D in Figure 5), had a more coherent organisation than other schools, according to their teachers, in alignment with theoretical expectations (Bass and Steidlmeier 1999; Burns 2003). This indicates that they had holistic visions that were integrated in their routines and structures, together with promotion of professional knowledge creation, in a supportive manner for the practical pedagogical teaching and learning. Scott (2013) claims that such strategies at the organisational level often induce improvements for both teachers and students.

Quality approaches and their importance for ESD implementation

Hargreaves and Shirley (2009) argue that the ESD implementation approach of a school is important because the permanence of the implementation depends on the school’s organisational routines and structures and the support the dimension of the organisation can provide for the implementation. Accordingly, we identified the general quality approaches of leaders at ESD-active schools as possible markers of schools with organisational structures attuned to ESD support. These general quality approaches have been identified in previous studies (Mogren and Gericke 2017a, 2017b) and here they provide the basis for interpreting our results.

We found that the organisations at schools with different general quality approaches had differing potential to support teaching and learning, according to the participating teachers. They reported that the organisation in schools with an external quality approach and interdisciplinary ESD implementation strategy (Permutation B) was slightly less coherent than in schools with an internal quality approach and interdisciplinary ESD implementation strategy (Permutation C). This could be explained by previous findings that leaders at the former schools base their management on proactive leadership, with a focus on cooperation with the local society (Mogren and Gericke 2017a, 2017b), which may distract them and impair their attention to their own school organisation. Focusing on external relations in quality assurance is consistent with suggestions in ESD policy documents (UNESCO 2004, 2014) and research (Breiting, Mayer, and Mogensen 2005; Wals and Schwarzin 2012; Scott 2013) that such interactions are important for successful ESD implementation. However, our results indicate that it may incur costs in the form of sub-optimal coherence in internal organisational structures. In schools following an internal quality approach and interdisciplinary ESD implementation strategy (Permutation C), the leaders were previously found to focus on quality assurance in the school organisation (Mogren and Gericke 2017a, 2017b). However, the differences (and samples) are small, and we are missing data for the permutation of an award-based ESD implementation strategy and external general quality approach, making it impossible to draw any firm conclusions.
The school that combined internal and external quality approaches together with both award and interdisciplinary ESD implementation strategies (Permutation D) received the highest scores for all the dimensions of Scherp’s model and coherence between them (Table 3 and Figure 5). This is a very important result since it confirms previous findings at the school leader level. In a previous study, the school leaders claimed that students at this school played an active role in planning their education and learning, primarily in a way that could be linked to societal needs. The school has a flexible scheduling system, which enables transformative activities that support students’ cooperation with the local society (Mogren and Gericke 2017b). Thus, this school seems to adjust its routines and structures to decrease barriers to the outside world that would otherwise prevent professional knowledge-creating impulses reaching the school organisation. This could explain the remarkably coherent school organisation perceived by the teachers.

Overall, the leaders at this school emphasised arguments related to transformative leadership (Mogren and Gericke 2017b), which may also be linked to the teachers’ perceptions of a highly coherent school organisation detected in this study. These findings corroborate our previous conclusions (Mogren and Gericke 2017b) that successful ESD implementation begins with proactive leadership, and recommendations that the school leader should take the first steps towards managing societal input into the school organisation, then a student-centred school organisation should be formed, in which the students are empowered to become actors in society.

Combining school leader-level data (Mogren and Gericke 2017a, b) with the teacher-level data obtained in this study enables triangulation, validation and confirmation of key features of a high-quality school organisation. Interlinking of different school levels is regarded by Gough (2005) as an indicator of a whole school approach, as described in both theoretical research (Scott 2013) and policy documents (UNESCO 2014). Thus, Permutation D could provide the closest option in a Swedish context to a whole school approach that clearly demonstrates use of a holistic vision bridging the other dimensions of school organisation and across all school levels.

**Implications for education and future research**

Based on this study, we can conclude that schools that adopt an interdisciplinary ESD implementation strategy in combination with an internal general quality approach have more supportive organisational structures, according to their teachers, than schools that adopt an award-based ESD implementation strategy with an external general quality approach.

At policy level, the ESD whole institutional approach initiatives strongly recommend collaboration between school institutions and society (UNESCO 2014). However, our results indicate that a school organisation should initially attend to its internal quality assurance before seeking such collaboration, and the most highly scoring school in our study indicates that a strong, coherent, pluralistic and praxis-oriented organisation (as in Permutation D) is essential, and greatly facilitates strong collaboration with the community.

In this study, we have operationalised Scherp’s school organisation model as an empirical tool (in the form of the questionnaire) and analytical guide. As argued in the Background section, we believe that it is highly suitable for ESD research because it was developed in school improvement research and meets requirements for a tool to investigate a whole school approach. Based on this study we can now expand the justifications for using the model, as follows. First, it can be used to assess the degree to which a holistic vision is implemented in the organisation (by gauging the importance attached to the logic and factors associated with routines and structures, and professional knowledge creation, and their coherence with the holistic vision) as suggested by McKeown and Hopkins (2007). Second, it is empirical and can be tested by the practitioners as recommended, for example, by Nikel and Lowe (2010). In this study, we investigated the teachers’ views of their organisations, but the model could be similarly used to investigate school leaders’, other staff members’ and even older students’ perceptions of the organisations. Third, the model can be used to study school organisations from a holistic and generic perspective, as called for by various researchers (e.g. Mogensen and Schnack 2010; Vare and
Scott 2007). Fourth, the model is designed to investigate school improvement processes, enabling ESD to be visualised at various stages of implementation, as previously outlined by Scott (2013). Fifth, the model has been developed and widely used in Sweden for over a decade (Scherp 2013a), so it is robust. However, it should be recognised that (Scherp’s) model has been developed interactively with Swedish practitioners and researchers, so it might need adjustment before use in school contexts of other countries. Finally, we claim that, although this is a case study based on limited data, the results are consistent and in line with other studies at these schools using other methods and study objects. Hence, both the results and method triangulation support the usefulness of the Scherp model.

In ongoing research, we are investigating the coherence between different levels of schools’ organisations, and assessing (inter alia) the consistency of results presented here and in previous studies with student outcomes in schools using different ESD implementation strategies and general quality approaches.

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