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Consider the unexpected: scaling ESD as a matter of learning

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ABSTRACT

This article aims to introduce a view of scaling as a learning process. In the article we discuss the concept of ‘scaling up’ or ‘scaling’ of Education for Sustainable Development (ESD) activities on the basis of how ‘scaling up’ ESD is highlighted in the UNESCO Global Action Programme (GAP) on ESD. Drawing on a Deweyan theory of learning as processes of transactional encounters, the article presents a conceptual framework of scaling-ESD-activities-as-learning. This conceptual framework is intended to have implications for ESD policy and ESE research. The theoretical specifications and practical implications presented are results of data collected using a participatory research approach (Re-Solve) and an abductive analysis. In this article, we argue that viewing scaling as a learning process enables a nuanced notion of scaling ESD-activities. This should be seen in relation to (a) complex sustainability challenges, (b) ethical aspects, (c) a more attentive and strict approach to scaling in ESD policy and (d) addressing questions of significant importance to scaling research.

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Introduction

The research presented in this article is a response to the UNESCO Education for Sustainable Development (ESD) Global Action Programme (GAP) (UNESCO 2014b). The GAP acknowledges that numerous ESD-activities¹ were initiated during the UNESCO decade for ESD (2005–2014). However, the GAP also emphasizes a need to ‘generate and scale-up action in all levels and areas of education and learning in order to accelerate progress towards sustainable development’ (UNESCO 2014a, 2014b, 2014d). The increased interest in ‘scaling’ in ESD policy is one reason for why it is important to address scaling ESD-activities in ESE research.

Another reason for doing so is that the UNESCO (2014c) discourse on scaling focuses primarily on ‘scaling up’ ESD-activities. According to educational and other research on scaling, ‘scaling up’ is one among many terms in a great variety of notions of scaling, i.e. of ‘moving activities from a small to a larger impact’ (Elmore 1996; Do 2015; Looi and Teh 2015). Some of these concepts are ‘scaling up’, ‘replication’, ‘expanding’, ‘going to scale’, ‘mainstreaming’, ‘rolling out’, ‘growing’, ‘scaling out’, ‘developing’.

Arguably, this is a limited understanding of what scaling ESD activities can mean. For example, Coburn (2003) and others (Glennan 2004; McDonald et al. 2006; Slavin and Madden 2013) are critical of research focusing on quantitative replication of educational activities as well as of more adaptive approaches focusing on horizontal spread (Mead and Simon 1996; Datnow, Hubbard, and Mehan 2002).

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Coburn (2003) argues that these ways of referring to scaling mask the complexity inherent in scaling processes, and others suggest that scaling is generally under-researched and lacks theoretical frameworks and conceptualisations (Denton, Vaughn, and Fletcher 2003; Harwell 2012; Fischer and Aubrecht 2015). Consequently, while there is scholarly agreement about the importance of scaling education, there are different and vague views on the relevance of different scaling dimensions and on how to scale educational activities.

Accordingly, in this article we are using ‘scaling’ instead of the popular ‘scaling up’. ‘Scaling’ is a term that emphasizes the inclusion of quantitative *and* qualitative dimensions of the expansion of ESD, acknowledging that scaling of ESD-activities occurs in different dimensions as well as in and across multiple scales and levels (Cash et al. 2006; Clarke and Dede 2009; Do 2015).

Accomplishing scaling necessitates moving beyond geographical spread to also include institutional dimensions and social networks that enable deep and meaningful change of practices (Coburn 2003). As such, scaling constitutes desired, i.e. sustainable and, to those involved, ethically acceptable change. This quite complex view of scaling is shared by Dewa et al. (2002), Harwell (2012) and Sternberg et al. (2013) who all argue that scaling practices need to adapt over time to meet *emerging challenges*, in which increased ownership of, and accountability for, the scaling process is crucial. It is crucial that the scaling process enables a shift from externally imposed initiatives to becoming an internal part of existing practices among those involved in the ‘sites’ to which educational activities are being scaled (McLaughlin and Mitra 2001).

Following this line of reasoning, we argue the importance of taking into consideration the ethical component of those who are involved in the scaling process (Sen 1989; Nussbaum 2003; Sayer 2012). Duggan, Smith, and Thomsen (2013) point to such ethical considerations when in addition to the *scaling up* and *scaling out* they also argue for the importance of *scaling in*. *Scaling in* refers to relating the scaling process to the often undefined or seldom acknowledged dimension of value-based pre-conditions for scaling. Unfortunately, Duggan et al. (ibid) do not elaborate further their concept of *scaling in*.

In conclusion, our study on what scaling of ESD-activities might mean is justified by the launching of the GAP and the explicit need to understand scaling of ESD activities. In the study we construct further, and clearer, knowledge on the topic and critically engage in potential practical implications of the results.

The article is structured as follows: After presenting aim and research questions, we will present the theoretical circumstances of our work. This is followed by a chapter on data construction method and method of data analysis. The following chapters present the results and a critical discussion of our study, concluding with a final discussion on the practical implications of our findings for ESD policy and ESE research.

Aim

On the basis of understanding scaling ESD-activities as a learning process, this article aims to explore the meaning of scaling in an ESD context.

One way to motivate the understanding of scaling ESD-activities as a learning process is UNEP’s observation that sustainability cannot be achieved through education that simply replicates more of the same (UNEP 2012). Rather, addressing complex sustainability challenges may demand a reorientation and discontinuation of present educational and learning practices. This is further emphasised in the 2030 Agenda for Sustainable Development (UN 2015) and the Global Sustainable Development Report (UN 2016). Drawing on how theories of learning accentuate the qualitative dimension of change and transformation (Dewey 1938; Dewey and Bentley 1949) and given that scaling of ESD-activities is supposed to engage a meaningful and lasting change (UNESCO 2006, 2014d) it is relevant to address scaling ESD-activities as a learning process rather than as technicist replications, which otherwise is often the case (Do 2015).

The following research questions are addressed:

How can a view of scaling-ESD-activities-as-learning be *operationalised*?

What *implications* could scaling-as-learning have for ESD policy and ESE research?

Theory

Scaling ESD-activities as transactional learning

In this study we rely on John Dewey's pragmatist theory of learning framing scaling-ESD-activities as a transactional learning process.

According to Glassman (2001) Dewey presents learning as a process of growth and development where we learn through experience in social events and activity in preparation for future encounters. Ontologically experience, social events and activity are interwoven in what Dewey describes as transactional relations (Dewey 1938; Dewey and Bentley 1949).

According to this theory of learning, meaning making is an emergent property of practices and the encounters between learner and other learners, artefacts and material, information, educators, facilitators, that occur in these practices (Hansson 2014). A transactional view on learning thus indicates a constructivist approach to meaning making, according to which meaning is continuously constructed and reconstructed as the qualitative (that is, meaningful) element of what is continuously becoming the subject's environment (Dewey 1938; Dewey and Bentley 1949; Rosenblatt 1985).

Central for this theory of learning is thus how experience is distributed spatially in the environment in/through encounters. Accordingly, Dewey emphasises the interconnections between our everyday experience and our environment in the learning process. This highlights the fact that our actions exist in a single interwoven unity and relate to the environment in a reciprocal connection. The environment is not reduced to an inert surrounding. This process of learning is sometimes labelled 'environing'. Accordingly, the transactional view on learning highlights that spaces and places [what we usually refer to as environment] that we encounter are qualitatively enmeshed in meaning-making processes as our needs, desires, emotions, actions, etc. are part of what Dewey refers to as 'environing conditions'. (Kronlid 2014, 59, 60). On account of this, our environment is always in a state of becoming as it is an integral part of a person's experience, thus the 'environment' can neither be defined nor comprehended beforehand (Kronlid 2014).

Consequently, if we adopt a transactional view on scaling-as-learning, scaling will cease to be a matter of quantitative transferring of the ESD-activity in question from one context to another, i.e. the notion of replication of 'best practices', 'pilots' and 'good examples' become obsolete. Rather, as soon as the activity in question is encountered by those who are the designated receivers of it, the ESD-activity in question will be part of the meaning making, i.e. the enviroing process of those involved in the scaling process. In other words, the activity will transact with the new context and those involved in that context. This will potentially involve a process of proactive, critically engaged adaptation to the specific character of the designated context, including the specific permutation of the particular sustainability challenges at hand.

Accordingly, the notion of scaling-as-learning builds on the continuity of experiential transaction that has no predefined optimal state but rather is a dynamic adaptation that aims at overcoming sustainability challenges faced by people in their context. In Dewey's terms, this continuity of experience means that one of the challenges of scaling ESD-activities is to make relevant past experiences in learning how to scale ESD-activities into the unknown future.

We argue that each case of scaling an ESD-activity has the potential of providing what we understand as a learning opportunity regarding how the activity can be realised in practice. By having the ESD-activity becoming part of *and* transforming ongoing ESD practices, lasting changes could be achieved in and through scaling-as-learning.

Participatory research design

This chapter includes a presentation of our research design where we have used a participatory research method to collaboratively construct scaling data. In this chapter we argue for the choice of method and present the particular participatory process used, i.e. the Re-Solve scaling process tool. The Re-Solve produced two types of empirical data. On the one hand multidisciplinary literature that focuses on

scaling and education, and on the other hand drawings, interviews, presentations, etc. To analyse the scaling data we utilised an abductive method in which content and thematic analysis of the data was coupled with theory development.

The main reason for choosing a participatory research method is that it combines participants' experiences and knowledge of scaling with relevant research literature (Bergold and Thomas 2012) in constructing scaling data. This is coherent with European curriculum studies in which experiential data and data from research are brought together in order to understand teaching and learning processes (Almqvist 2005; Öhman 2006; Lundqvist 2009; Lidar 2010; Östman 2010; Hansson 2014; Kramming 2017). Furthermore, a participatory method were chosen in favour of e.g. action research since participatory research enables conditions for developing context-related knowledge about shared matters of concern among the participants and researchers. That is, while participatory research in general seek to be relevant for creating social change, it is equally important to construct knowledge, which may or may not be actionable (Whyte 1989). Thus, the results from our study has a theoretical component, which may imply ESD scaling action on policy and research level aimed at social change.

Participatory research, is a method that enables emergence of new knowledge through the collaborative process (Reason and Rowan 1981). Hence, as a joint process of knowledge-construction, collaborative learning is key in participatory research. This enables the full potential of the research for learning outcomes in the particular social, i.e. scaling, context (Bell et al. 2004; Bergold and Thomas 2012). In this, participants and researchers engage critically with their previous and emergent experiences and knowledge in the learning process, which is facilitated. The process is thus ultimately expected to expand knowledge and theorizing of the shared matter of concern, in our case, scaling of ESD-activities.

The Re-Solve process tool

We have used Re-Solve, an iterative capacity building process tool to construct data on scaling of ESD-activities. Re-Solve was initiated by the Swedish Centre of Education for Sustainable Development (SWEDESD) as a *circular reflective process tool* for scaling ESD-activities involving a number of collaborative workshops planned, executed, and assessed in collaboration with participants.² Importantly, Re-Solve was designed to both enhance theoretically and experientially grounded scaling of ESD activities, and to construct data on scaling of ESD. Regarding the latter, Re-Solve is designed to enable identification of relevant literature on scaling and scaling education, and of relevant real world experiences of scaling of ESD-activities. Thus, Re-Solve facilitates an abductive, critical, and iterative process aiming at (a) supporting evidence-based scaling of scaleable ESD-activities and (b) identifying and constructing scaling ESD data.

Accordingly, this article presents results from three series of Re-Solve workshops in Sweden during the fall of 2015 with a team from SWEDESD, in South Africa in March of 2016 in collaboration with the Environmental Learning Research Centre (ELRC) at Rhodes University with a team from the Environmental Education Association of Southern Africa (EEASA) and in Ecuador in collaboration with ReAct (action on antibiotic resistance) Latin America in July 2016, with a team of educators from university, public school and informal education.³

Admittedly, Unger (2012) and Bergold and Thomas (2012) emphasises the importance of designing your participatory study to *build on* participants' knowledge and experience. Hence, using Re-Solve in the collaborative construction of data on scaling of ESD was fruitful. It to facilitated enabling conditions for knowledge construction relevant to the specific scaling challenges in each context, acceptable in the light of values of different contexts, and aligned with relevant scaling and educational research.

As a dynamic and yet systematic tool for data construction, Re-Solve has two principle elements. The first element is generic and is identical in each case of Re-Solve. The second element is collaboratively designed in context to suit the specific challenges associated with scaling of ESD-activities in each case and place. In the following we will present Re-Solve's generic features followed by the specific outline of Re-Solve in Sweden, South Africa and Ecuador.

Re-Solve's generic elements

From a capacity building perspective, a Re-Solve process always starts with a pre-analysis aiming at selecting a number of minimum 3-year ESD-activities. The choice of ESD-activities is based on material submitted by the participants to the facilitators. Secondly, drawing on the selected ESD-activities the next preparatory step is, in dialogue with the participants, to design the process. Accordingly, the number, themes and order of the workshops are decided. To a certain extent, the specific workshop-exercises are also selected in dialogue with the participants. Thirdly, the facilitators and participants discuss the specific prioritized outcomes of the process. In general, each workshop will deliver outcomes related to the workshop themes, and there will also be a synthesized outcome based on all workshops. Finally, regardless of context, ReSolve always draws on relevant policy and research as a framing of the specific ESD-activities.

From a data construction perspective, the Re-Solve pre-analysis includes the start of identifying relevant multidisciplinary literature (reports, papers, research, etc.) on scaling, i.e. the first category of data. In addition, the four preparatory steps also frame the second kind of experiential data, that will be constructed throughout the process. A final comment on Re-Solve as a data constructing tool is that there is always a continuous iteration between literature data and experiential data. That is, novel understandings of scaling ESD-activities arising from either literature or workshop experience, are used to redirect our attention, to introduce new exercises and to engage in new literature (see Figure 1).

The following part of this chapter presents an overview of each of the three Re-Solve workshop series.

Three cases of Re-Solve

Table 1 shows the setup of the first Re-Solve. A preparatory research overview on scaling was compiled initially (Do 2015). Then the workshop series started in the participants' intuitive understandings of scaling with the aim of collaboratively outlining scalability indicators. These indicators formed the basis for developing a number of scalability criteria. The participants utilised these criteria to increase the understanding of the possibilities of scaling ESD-activities. The criteria were 'stress tested' with regards to their ability to account for different types of ESD-activities. Finally, a scaling vision and action plan for scaling ESD-activities was outlined.

Table 2 presents the design of the 2nd round of Re-Solve in South Africa in March 2015. Fewer workshops, more condensed content, a stronger sense of accountability and participation from the participants, and a shifting of order of workshops were evident compared to the 1st round. The reason for some of these changes was that as we entered the second round we had already created a tentative conceptual framework for scaling ESD-activities emerging from policy, scaling research and ReSolve round one. Hence, we could now begin with a more stable, yet dynamic, conceptual framework.



Figure 1. ReSolve process framework and model (Do 2015).

Table 1. Re-Solve Sweden, September – December 2015.

	Workshop 1	Workshop 2	Workshop 3	Workshop 4	Workshop 5	Workshop 6
Aim:	To construct indicators of scalability in general	To develop internal & external criteria for scaling in particular	To apply scaling criteria to selected ESD-activities	To develop the concept of scaling in relation to selected ESD-activities	To construct scaling ESD vision and identify scaling ESD resources	To construct scaling action plan and to evaluate the Re-Solve process

Table 2. Re-Solve South Africa, March 2016.

	Workshop 1	Workshop 2	Workshop 3	Workshop 4	Workshop 5
Aim:	To introduce concepts of scaling	To develop indicative descriptions of scaling using results from WS1	To self-assess selected ESD-activities using results from WS2	To construct scaling visions and identify scaling resources	To construct scaling action Plan and to evaluate the Re-Solve process

Table 3. Re-Solve Ecuador, July 2016.

	Workshop 1	Workshop 2	Workshop 3	Workshop 4	Workshop 5
Aim:	To reflect on current educational practice in relation to ABR	To reflect on how the ESD-activity on ABR could be introduced into participants' educational practice	To continue and iteratively reflect on how the ESD-activity on ABR could be introduced into participants educational practice	To continue and iteratively reflect on how the ESD-activity on ABR could be introduced into participants educational practice	To construct scaling vision of the ESD-activity and to construct a scaling action plan

The third round of workshops was held in Ecuador in collaboration with ReAct Latin America. The setup of the workshop series is presented in Table 3. This ReSolve round focused on health education in the context of the challenge of antibiotic resistance (ABR). This 3rd Re-Solve was integrated as a series of shorter capacity building workshops in a week-long main workshop on antibiotic resistance (ABR) Education – *Alforja Educativa* (Cars et al. 2008; Laxminarayan et al. 2013; Nathan and Cars 2014; Jasovský et al. 2016; Laxminarayan and Chaudhury 2016). The aim of the 3rd Re-Solve was to elicit participants' reflections on their ABR educational practices in terms of scaling and how they could incorporate the *Alforja Educativa* approach in their scaling of ABR educational practices.

In conclusion, ReSolve was facilitated to co-construct data on scaling-as-learning in three cases. Although some of the elements of ReSolve remained the same across contexts and cases, each round of Re-Solve was specifically designed to address the context-specific challenges of scaling-as-learning in each case. The data was assembled in the form of drawings, participant notes, facilitator notes, assessments, and in some cases interviews.

A challenge we encountered was that the participants of the three Re-Solve processes were not involved to the same degree. E.g. the participants connected to the ELRC were more actively involved in key decisions regarding the development of 'their' Re-Solve and hence of the conceptual framework. However, as pointed out in the literature (Bergold and Thomas 2012; Cook 2012) this is not problematic.

Method for data analysis

As our method for analysing the data constructed through the ReSolve participatory research approach we utilised an abductive method (Peirce 1955; Niiniluoto 1999) where content and thematic analysis was coupled with theory development. As mentioned above this data includes both relevant literature

on scaling and scaling education as well as relevant real world experiences of scaling of ESD-activities. Abduction as a method for data analysis involves encountering in the interpretation of data (an interpretation that is informed by theory) a phenomenon that has characteristics for which we lack sufficient explanations or theories (Peirce 1955; Reichertz 2010). As noted by Reichertz (2010) abduction starts in these surprising data results for which we lack a theoretical conceptualisation, and proceeds in the development of theory to fill the gap by bringing together conceptualisations and theories. This forms the basis for further steps to operationalise the theory explaining empirical data, in which case we may very well be surprised once more. The content (Corbin and Strauss 2008) and thematic (Fereday and Muir-Cochrane 2006) analyses enable us to identify recurring themes and patterns in the data, i.e. literature and real world experiences. These themes informed our theoretical conceptualisation of scaling-ESD-activities-as-learning.

Results: a scaling-ESD-activities-as-learning conceptual framework

In this section we present results from the participatory research process of the Re-Solve where a number of workshops enabled us to reflect on scaling theory and practice. The empirical data included scaling ESD activities within Swedish, Southern African and Ecuadorian contexts collected through three series of Re-Solve workshops. The analysis resulted in a progressive emergence of a conceptual framework of scaling-ESD-activities-as-learning. The conceptual framework has components of educational scaling research, learning theory as well as ethical considerations and can, as we will argue in the discussion, be used to answer questions of who, what, when, where, how, and why with regards to scaling ESD activities as learning. As such, scaling-ESD-activities-as-learning centers on three principal concepts; scaling object, scaling subject and scaling site.

As argued by Jabareen (2009) we understand 'conceptual framework' as a set of interlinked concepts, contributing to a comprehensive whole that can assist in understanding phenomena. Importantly, the conceptual framework is not a 'model' for predicting scaling processes but is explorative and dynamic. As an evolving framework, it shares similar qualities with learning processes, i.e. both are non-linear in that what will be learned cannot be predicted. This means that we can use the framework to understand scaling and scaling action, but not to predict those scaling-as-learning processes.

Our conceptual framework consists of a number of characteristics (or sub-concepts) of scaling ESD. The six characteristics of scaling ESD that will be presented provides an internal structure for scaling organized so as to fit together and play an integral role in constituting the meaning of scaling-ESD-as-learning (Jabareen 2009). The following characteristics (or sub-concepts) will be presented: scaling object, scaling subject, scaling site, scaling pathway, scaling resources, and scaling drivers.

Scaling object

Scaling object refers to the specific ESD-activity, or elements thereof, that are put to scale. Admittedly, both literature and workshops suggest that it is important to find a way to talk about that which is being scaled on a generic level, i.e. as the object of scaling as an objective.

As is suggested in a dialogue around a 'Inquiry Based Approach' (IBA) during WS 4 in the Swedish Re-Solve, those involved in scaling ESD may not share the same view on what is the scaling object, pointing to the complexity of scaling ESD-activities. Moreover, the scaling object may actually consist of different things. For example, in the case of the scaling of the IBA in Sweden, the Re-Solve dialogue showed that IBA can be described as a method for inquiry, a model for facilitating stakeholder dialogue and a set of values. It was shown in reflective writing of participants in the Ecuadorian case that the *scalable* components of the ESD-activity can take a range of forms. On one hand components can be pinpointed as factual content or as educational methods consisting of education that follows a clear structure in which contents and methods to different degrees are dependent on context and relevance. On the other hand, the components can take the form of more general educational approaches or even onto-epistemological worldviews as illustrated in the Ecuadorian case. Furthermore, the experiential

data of the Ecuadorian case illustrate that ESD-activities seldom involve just one type of scaling object. Throughout the analysis of the scaling data a tension was identified between multiple scaling objects. On one hand, a scaling object aimed to scale metaphors of co-existence with bacteria and the ancestral/traditional values of Sumak Kawsay. On the other hand, a scaling object centered on the child-to-child methodology that emphasizes greater agency for children, families and communities to define the challenges of antibiotic resistance.

Furthermore, the transactional learning theory of scaling-as-learning and examples from scaling literature (Clarke and Dede 2009; Harwell 2012; Looi and Teh 2015) suggest that scaling processes have a potentially transformative effect on what constitutes the ESD-activity in question. Thus arguably, the scaling object will transform as it enters into relation with its new context. This dynamic quality of ESD-activities is an additional reason for why we need a qualitative concept of scaling object that can be used across contexts and shifting qualities of the ESD-activity in question.

Scaling subject

The second characteristic of scaling is *scaling subject*. Not surprisingly, scaling subject refers to those who are involved in the scaling-as-learning process. This sub-concept of scaling is intuitively compelling as there is always someone involved in scaling processes. However, our study suggests that scaling-ESD-as-learning indicates that a number of functions or subject positions are potentially important to sustain scaling of ESD activities.

Several of the reflections by participants in the South African Re-Solve workshop emphasised this as they emphasised the importance of engaging the ESD practitioners *in situ* when scaling an ESD activity into a new social context. The contention was that those involved in ongoing ESD practices in the designated context should also be principal drivers of the scaling process rather than only passive recipients of the scaling object. Consequently, both the instigators of the scaling process and the recipients of the scaling object should be engaged as active partners in adapting, re-contextualising and developing the ESD-activity to address the sustainability challenges in question and *in situ*. Drawing on their experiences of scaling ESD-activities the participants of the South African workshop also argued along these lines suggesting that it is key for sustained scaling of an ESD-activity that the scaling-as-learning process enables recipient agency. This is a point also made by Coburn (2003) implying that scaling-as-learning involves sustaining a qualitative and quantitative continuity of ESD-activities across contexts, which depends on a shift in ownership of the scaling object. This shift in ownership is according to Coburn, deep. Thus the transactional aspect of scaling-as-learning involves change that goes beyond changes in materials, classroom organization, or the addition of specific activities to alter teachers' [and we would add also learners'] beliefs, norms of social interaction, and pedagogical [or social learning] principles as enacted in the curriculum [or policy] (2003, 4).

Accordingly, scaling subjects can include a wide range of people or positions. In the experiential data from Sweden this conclusion was further validated as discussions during WS4 concerned the importance of involving donors and funders, researchers, university and college lecturers as they often are perceived as central to educational processes. In addition, the experiential data from Southern Africa illustrated the importance of engaging educational practitioners and trainers in both formal and informal education. Furthermore, the Ecuadorian case showed that those often considered as passive recipients of education, children, families, and local communities have a crucial function to enable sustaining the scaling of ESD-activities. This discussion further validated a point made by participants in the Swedish and the South African Re-Solve that there might also be victims of scaling-ESD-as-learning. That is, that scaling-as-learning is a process of inclusion and exclusion of certain scaling objects and subjects. Consequently, scaling subjects are therefore found on multiple levels ranging from research to policy and practice.

Scaling site

Scaling site as the third characteristic of scaling-as-learning relates to the specifics of the context where ESD-activities as scaling object is to be introduced by the instigating scaling subjects. In one way, scaling site is the home of the hopefully active recipient of the scaling object in question.

These contexts encompass natural and human-made environments as well as the often activities that make up its specific, wicked (Rittel and Webber 1973; Kronlid 2014) sustainability challenges. Scaling sites are viewed as places where scaling is, literally, taking place and where encounters, within the frame of scaling, are occurring and experienced by those involved making up the educational activity of scaling.

Examples of this from scaling literature can be found in Coburn's suggestion that '[a]s a second element of scale, consequential change must be sustained'. (6) This notion of scaling being sustainable over time, coheres also with a transactional view of scaling-as-learning as Dewey highlights the continuity of experience as key in learning processes. Scaling-as-learning, from a transactional perspective, thus indicates, following Coburn, that a defining characteristic of scaling-as-learning is that the scaling object moves to-and-through the site into which it is being scaled. This and further reflections on scaling sites during the South African Re-Solve workshop led to the notion of two kinds of scaling sites; source sites as the site from which the object is coming and target site as the site which it is aiming for. However, as the scaling object is travelling to-and-through sites, the target site also becomes a source site as the object is scaled further towards other sites.

The importance of being able to address these contexts as sites for scaling is also validated by Clarke and Dede (2009) who add the notion of evolution to scaling. Evolution refers to:

when the adopters of an innovation revise it and adapt it in such a way that it is influential in reshaping the thinking of its designers. This in turn creates a community of practice between adopters and designers whereby the innovation evolves. In order to achieve scale along this dimension, researchers need to learn from users' adaptations to rethink the innovations' design model. (362)

This quote suggests that there indeed is an ongoing transactional and transformative process in which scaling subjects, object, and sites are involved. From the perspective of learning as transaction, this notion of evolution in scaling of an ESD-activity means that those initiating the scaling will also be transformed as a result of the (learning) process. In other words, object, subjects and sites are all potential "transactants" (Hofverberg and Maivorsdotter 2017) in the scaling-as-learning process.

In scaling ESD activities, we need to pay attention to, how introducing scaling objects affects the valued beings and doings (Sen 1989; Nussbaum 2003; Sayer 2012; Kronlid 2014) of the scaling subjects in the scaling site. The scaling object should not be in too much of a conflict with the emergence of the valued beings and doings that change, transform, or transgress over time in response to social, cultural and economic conditions (Lotz-Sisitka et al. 2015). Accordingly, paying attention to the transactional adaptation of the ESD activity to these emerging ethical values is crucial for scaling to result in meaningful and sustainable change (Coburn 2003; Clarke and Dede 2009).

Examples from the experiential data further suggests the multifarious characteristic of scaling-as-learning. For example, in the Swedish Re-Solve, the ESD-activities involved, i.e. the programmes of Education for Strong Sustainability and Agency (ESSA) and IBA involved a context in which policy, universities and municipalities intersected. This multiplicity in the forms of scaling sites were further exemplified in drawings of scaling visions made by participants in WS4 of the South African Re-Solve. These visions included teacher training colleges and national curricula as well as local communities and small scale farms. Thus, our study suggests that scaling sites are made-up of formal educational institutions, educational and aid policy, local communities, small scale farmers and families.

Scaling pathway

The fourth characteristic of scaling-as-learning is *scaling pathways*. It is easy to neglect the complexities of the specific route along which the *scaling object* travels from its source site to its target site. Arguably, because we are inclined to look at scaling in retrospect we seem to focus on the question whether or not a scaling object have in fact reached a new destination – almost as a retrospective snapshot of a frozen situation – rather than analysing scaling in process.

In our study, we also collected data in retrospect, but, with a focus on the question of who was involved, what did enable scaling, and where did the scaling object travel in the process of scaling of the ESD-activity in question.

Accordingly, our literature study and throughout the critical reflections, e.g. from the data collected from WS3 in the South Africa Re-Solve, show that the scaling object travels along a complex pathway. Drawing on examples from the experiential data these scaling pathways can take a range of forms. In the Swedish Re-Solve workshop participants reflections on the case of ESSA showed that the scaling pathway can be the mainstreaming of ESD-activities in teacher training institutions. Another example is from the written reflections by the participants in Re-Solve Ecuador that illustrated how the pathway involves educational practitioners and families in local communities.

Drawing on these and other empirical Re-Solve examples and on relevant literature, we suggest that the complexity of the *scaling pathway* is represented by an ESD-activity that moves along vertical, horizontal and/or functional scales as well as across spatial, temporal, jurisdictional, institutional, management, network, and knowledge areas and levels. As Cash et.al (2006) argue, there is a cross-scale dynamic to scaling pointing to scaling as an ESD-activity that is not limited to linear, teleologically governed transportation from geographical (or institutional) location A to location B.

Rather, what our study indicates is that the scaling object will begin a (transactional) journey along a single-, multi-, and cross-level/ scale pathway (Cash et al 2006). One reason for this conclusion is that from a qualitative scaling-as-learning perspective, the scaling object will continuously be re-contextualized (or, transacted) as it is being put to scale. Importantly, it is necessary to address the complexity of putting something to scale in order to understand what Coburn (2003) and Clarke and Dede (2009) refers to as depth, sustainability, shift in ownership and evolution in the scaling process. We understand these four characteristics of scaling as principles of ESD. Given the complexity of the scaling pathway the need to address this specific characteristic of scaling-ESD-as-learning relies further on the conclusion that for a scaling object to find purchase in its target site, an expansion of agency of scaling subjects is also key to enable a shift in ownership of the scaling object.

Scaling resource

Scaling resources signify that which is necessary to draw on by a person, organization or institution in order to function effectively to put scaling objects to scale. During the three ReSolve processes we have come across scaling literature that present different types of resources such as institutional frameworks, organisational capacity, different partnerships, policy, and financial resources (Cash et al 2006; Harwell 2012).

In the South African Re-Solve, discussions about scaling resources focused on human resources, implying that there is a great amount of skill and experience within particular ESD-teams that can be put to action in scaling-ESD-as-learning. The notion of 'relational' resources was furthermore mentioned implying a quality to human resources that has to do with a ability to jointly engage in scaling-as-learning in situations where individual agency or capacity to scale ESD activities along multiple levels and areas do not exist.

In addition, the combination of resources highlighted the importance of policy support and political willingness and mandates, as well as educational materials and cooperation among educational practitioners. Furthermore, it was concluded that scaling resources will be needed in order to navigate scaling pathways and in each case needs to be determined through strategic scaling analyses.

Scaling driver

The final characteristic of scaling-as-learning is *scaling drivers*. A scaling driver is a function, event, action, circumstance or agent that boosts scaling-as-learning. Drawing on scaling literature (Slavin and Madden 2013; Looi and Teh 2015) visioning and leadership, incentives and accountability, external catalysts and communication are highlighted as important scaling drivers in general.

When listening to the participant dialogue during the South African Re-Solve workshop it became obvious that one of the drivers behind the scaling was the opportunity to critically engage in the of sharing of scaling stories. Hence, we can add *story sharing* to the list of scaling drivers. Furthermore, context-sensitivity, timing and local relevance, and scientific accuracy were mentioned in the Swedish and South African Re-Solve.

Context sensitivity refers to a certain ability and skill to pay attention to and read how scaling of an ESD-activity may 'fit' local situations. This includes 'reading' how economic, socio-cultural, and ecological historical trajectories are enacted in present urgent sustainability issues.

Participants in the South African Re-Solve also testified to the importance of introducing the ESD-activity in a timely and locally relevant fashion in order to boost scaling-ESD-as-learning. The timing aspect challenges the notion that an ESD-activity is considered a 'good' or even 'best' practice is a sufficient condition for it to be scalable. Finding a favorable (in scaling terms) moment to scale an ESD-activity may be crucial in enabling a fruitful re-contextualisation of the ESD-activity. This fact was testified to by the participants in the Re-Solve workshops in Sweden and South Africa during the self-assessment exercises.

Finally, we found through our literature studies (McLaughlin and Mitra 2001; McMaster and Fuchs 2011) and the three Re-Solve workshop series that whether or not the scaling object is scientifically accurate is an important driver for scaling-ESD-as-learning. Moreover, scientific accuracy can also be justified as scaling driver on the grounds that scaling drivers need to be intuitively compelling for those involved.

An important result of the article is that there are no general definitions of scaling-ESD-activities-as-learning since this must be understood in context. This has been shown above and is further presented in Table 4 (see Table 4) detailing the scaling framework in context.

Implications for ESD policy and research. A concluding discussion

Throughout the article, we have used and developed an understanding of scaling-ESD-activities-as-learning drawing on Deweyan learning theory. Accordingly, we are exploring a concept of scaling that moves beyond a concept of vertical 'scaling up' or instrumental replication of 'pilots', 'good examples' or 'best practices'. In this conceptualization, we engage ESD questions of what is scaled, where is it scaled and who is involved, how it is performed as well as how ethical considerations come into play in scaling. In the following we will discuss a number of implications that scaling-ESD-activities-as-learning may have for ESD policy and ESE research.

Implications for ESD policy and the GAP

The conceptual framework presented in this article consists of two principal parts; scaling as a transactional learning process and scaling aligned with the four principles of ESD, i.e. depth, sustainability, shift in ownership and evolution. This understanding of scaling as a dynamic process where the learning outcome of scaling is only known post-fact implies for ESD policy and the GAP both a more attentive and strict approach to scaling.

First, in terms of being more attentive, the ESD policy and the GAP would need to reconsider the ESD-activities that were carried out during the DESD and onward. As outlined in this article, both the ESD-activities and their scaling objects transform as a result of the scaling process. Thus, ESD-policy should approach scaling as beyond the replication and transfer of ESD-activities. Rather, ESD-policy and



Table 4. Qualitative elements of scaling-as-learning.

	Scaling object	Scaling subjects	Scaling site	Scaling pathway	Scaling resources	Scaling drivers
Sweden	<ul style="list-style-type: none"> Educational approach Educational methods 	<ul style="list-style-type: none"> Researchers Teachers Lecturers at colleges and universities Employees in municipality/ NGOs 	<ul style="list-style-type: none"> Swedish organisations/ NGOs and municipalities Educational institutions in Sweden and Southern Africa 	<ul style="list-style-type: none"> Collaborations between schools and communities Context sensitivity, adaptation to new conditions through de- and re-contextualisation 	<ul style="list-style-type: none"> Enabling policy Strong partnerships Facilitation Cooperation 	<ul style="list-style-type: none"> Context sensitivity Timing and local relevance Scientific accuracy
South Africa	<ul style="list-style-type: none"> Educational approach Educational method Factual content 	<ul style="list-style-type: none"> Small scale farmers Practitioners Researchers Donors and funders Educators Agricultural extension officers Employees at agricultural colleges 	<ul style="list-style-type: none"> Research and practice networks Local Communities Small scale farms Educational Institutions, 	<ul style="list-style-type: none"> Institutionalization of projects Projects that generate new projects Working together with others instead of working on the other Projects that are not limited to a specific context but connect multiple contexts historically Fluctuation and in terms of resources and funding 	<ul style="list-style-type: none"> Political willingness Leadership Mandates Social resources or ethos Networks among practitioners and researchers Space in terms of adaptation Organisational capacity Incentives and accountability Good governance Legitimacy 	<ul style="list-style-type: none"> Partnership based on trust People who have been in the field for a long time are enablers for scaling Networks that link engaged people and researchers together Capabilities expansion
Ecuador	<ul style="list-style-type: none"> Onto-epistemology Factual content Educational method 	<ul style="list-style-type: none"> Educational practitioners in both formal and informal education Children Families Local communities 	<ul style="list-style-type: none"> Educational workshops School Family homes Local community 	<ul style="list-style-type: none"> Starting with input from families, community and children Educators as both learners and teachers Children as both learners and teachers Families and community as recipients 	<ul style="list-style-type: none"> Educational material Time and space in the curriculum enabling long term engagement 	<ul style="list-style-type: none"> Families and community in defining the challenge Educators in school Children outside of school in families and community

the GAP would benefit from approaching scaling as a multifaceted process that includes both directed and spontaneous spreading and acquisition of central qualities of ESD-activities. Our conceptual framework thus encourages a more attentive and nuanced approach to the scaling of previous as well as ongoing and future ESD-activities.

Second, in terms of being more strict, the ESD policy and the GAP would benefit from aligning the notion and practice of scaling with the four principles of ESD. This implies that the ESD-policy can be stricter in its evaluation of efforts to scale ESD-activities, moving beyond technical short term activities or box-ticking of doing more of the same in different locations. Scaling would rather be evaluated on its ability to build capacity among those involved to re-contextualise scaling objects in respective scaling sites.

Third, ESD policy and the GAP should encourage ESD-stakeholders to engage with what we refer to as potential scaling beneficiaries and victims at the outset of planning new ESD activities and interventions. This would increase the scalability of potential scaling objects.

Implications for ESE research

First, the article shows that scaling is not as much a question of vertical and horizontal transfer of knowledge, models, etc. in geographical, social, and cultural space. Rather scaling is a transformative process in which subjects of different species and the scaling objects are both transformative and transform each other, *and* the geographical, social, and cultural spaces in which it migrates.

Second, it is possible and sometimes desirable, in ESE-research, to approach scaling as a question of individual, social and institutional learning. Consequently, the article suggests that learning theory and educational research can enrich our understanding of and research about scaling-ESD-activities.

Third, from this follows that ESE-research may not merely be a complement to scaling research in general but it addresses questions of significant importance that scaling research at the moment is not equipped to deal with. Hence, ESE-research may inform empirical and theoretical scaling studies in general and interdisciplinary scaling studies in particular.

Fourth, *paying attention to scaling-ESD-activities-as-learning* would enable a theoretically nuanced and empirically sensitised ESE scaling research. Importantly, we do not argue that scaling *is* a learning process but that we should approach scaling ESD-activities *as* a learning process. Admittedly, such a methodological/analytical approach implies an open-ended research process in which qualitative aspects of the depth, sustainability, accountability and involvement of scaling ESD can be identified. These aspects are hard to capture if adopting a technician or instrumental approach to scaling. This implies understanding scaling ESD-activities as movements and moments of re-contextualisation, adaptation and transformation.

Notes

1. In this article ESD-activities refers to different ESD interventions, i.e. formal and non-formal ESD projects and programmes, models, innovations, and other spontaneously emerged activities.
2. Re-Solve was originally developed by a team from Department of Education (David O. Kronlid), Uppsala Center for Sustainable Development (Sara Andersson & Misol Kim), and the Entrepreneurship Lab at the Department of Business Studies (Mikael Scherdin), all at Uppsala University. Re-Solve was originally designed as a circular process tool for multi-stakeholder sustainability challenges projects aiming at helping practitioners to think and analyse challenges systematically and to collaboratively create and implement innovative and resilient (re)solutions. See <http://www.resolveprocess.se/> for more information on this phase of Re-Solve.
3. The participatory research in which ReSolve was an important component, has since then been carried forward, resulting in commitments to a number of joint research papers along with two workshop sessions held at the Environmental Education Association of Southern Africa (EEASA) conference in Johannesburg, South Africa in October 2016. Furthermore, during 2016–2017, SWEDESD has continued to collect ESD-scaling data in collaboration with Swedish municipalities, a private green company in Sweden and with the Nobel Foundation in Stockholm.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Martin Mickelsson is doctoral student in Curriculum Studies at Uppsala University. His research is in Environmental and Sustainability Education. His particular interests are in questions of what makes educational innovations, that in one context are deemed successful, scalable to other contexts and how these scaling processes can be understood in terms of learning. As part of this I engage questions of agency and subjectification, ethic considerations and indigenous knowledge. Currently, I am writing my doctoral thesis in curriculum studies on the scaling of educational innovation within research collaborations that includes researchers and practitioners from Southern Africa as well as Ecuador.

David O. Kronlid has conducted interdisciplinary ethics research around ecofeminism, mobility, climate change justice, and education for sustainable development (ESD) for the past 15 years. In collaboration with national and international partners he has explored theorizing and methods around cross-disciplinary sustainable development higher education and research, developed ESD teaching and learning models for value education, and innovated problem solving process tools for municipalities and ESD-agents in post-normal situations. Recently, he leads a process of co-developing – in collaboration with international partners – a critical and reflexive process tool *Re-Solve* for (up)scaling of ESD and other educational activities. *Re-Solve* is at present being further developed with early adopters/partners in e.g. Southern Africa, the Nobel Foundation, and municipalities in Finland, Sweden, and Poland.

Heila Lotz-Sisitka works as a professor in the Environmental Learning Research Centre at Rhodes University in the Faculty of Education, where she holds a South African National Research Foundation Chair in Transformative Social Learning and Green Skills Learning Pathways. The Chair's work focusses on ways in which transformative learning and green skills learning pathways can strengthen people's participation in securing more socially just and sustainable forms life and living. It foregrounds collective agency for transformative change in society. She has a background in critical research methodologies and a long standing commitment to furthering and extending participation in education. Her current research interests focus on the relationship between environmental learning, agency and social-ecological and social system transformation. Currently she is Principal Investigator for an International Social Science Research Programme focusing on Transformations to Sustainability with emphasis on '*Transgressive social learning and social-ecological systems change in times of climate change.*'

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