



Cycles of meaning-making crystallization in the WeValue InSitu process as clear contributions towards transformative learning

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ABSTRACT

Transformative learning is highly sought by practitioners and academics in sustainable development, education for sustainable development, and adult education, because it involves shifts in perspectives which can potentially underpin *significant changes* in worldviews and ways of learning. A practice-based design process for crystallizing local shared values, called *WeValue InSitu*, is already reported to regularly produce transformative learning (TL), but its lack of discipline- or theory-based origins means there are currently no ways to formalise its mechanisms. There is thus a need to conceptualize the sub-processes within it in order to provide a theoretical underpinning, and to extract key contributions to the production of transformative learning (TL). Here, Polanyi's fine-toothed micro-processes are used to analyse discourses from transcripts of a *WeValue InSitu* event to reveal patterns of meaning-making and meaning-checking cycles. Also identified are key facilitator actions of: redirecting, challenging, refocusing, reflecting back, and disentangling concepts. These findings allow a self-consistent conceptualization of the *WeValue InSitu* sub-processes and thus a formal methodology. Furthermore, these will lead to more widespread transferability and scaling-up of *WeValue InSitu* in the field, to meet demand for its known uses e.g. in climate change adaptation planning, sustainability assessments, and education. The reconceptualized sub-processes also contribute to wider TL research, since it will enable *reliable TL production* to replace fortuitous case studies. With that, there can now be a new TL research agenda for systematic studies e.g. of TL learning mechanisms and contextual influences on TL.

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1. Introduction

Advances in cleaner production will not evolve without specific intervention, because the stakeholders involved at every level of decision-making bring with them a legacy of viewpoints focused on profit and convenience: sustainability is still a new idea. Triple-bottom line requirements covering three pillars of sustainability via indicators (social, environmental, financial) (Hacking et al., 2008) are good drivers for *incremental* improvements, but the Inter-governmental Panel for Climate Change II (IPCC, 2014) calls for adoption of newer learning paradigms to accelerate actual *shifts in perspective* – specifically mentioning Transformative Learning.

This paper presents work at the nexus of social indicator design, and transformational learning, making contributions to both areas. A basic background on both areas is provided, because neither can separately produce the contributions presented here.

This investigation centres on a practice-based design-approach for co-creating social indicators named *WeValue InSitu* which has regularly, but incidentally to its main purpose, produced evidence of causing transformative learning – which is highly sought after in other fields. Considering firstly, the perspective of social indicator research, the approach is now published and established as very useful in several fields, and there is a demand for its scaled use globally. The current challenge is that its practice-based approach must first *be re-conceptualized* in a manner that allows it to be communicated formally for this kind of transferability: new facilitators need to be trained via manuals, not apprenticeships. Thus, any such formal conceptualization is an outstanding research question in social indicator design, and addressed here.

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Secondly, from the perspective of transformational learning research, there is no other reported approach which can *reliably and predictably produce transformational learning (TL)*. Thus, if the reconceptualization work proposed here could reveal formalized sub-processes in the *WeValue InSitu* approach, this would make a contribution to a significant knowledge gap. Although transformational learning (TL) is currently investigated and described in different fields via various paradigms (including formal educational pedagogy; emancipation; sustainability), none offers a prescriptive, practice-based approach which can regularly *produce it*. In other words, existing conceptualisations cannot produce their TL goals, suggesting gaps in theoretical understanding. Thus, empirical identification of the relevant sub-processes of the standard *WeValue InSitu* approach which regularly produces TL, would be a significant contribution to theory-building, and is the first research question addressed here. (Further studies would still be required to understand the underlying links to 'formal' learning or educational processes.)

2. Background on the two overlapping research areas

Relevant background of the first research area is provided via understanding the evolution of the *WeValue InSitu* approach, which was originally designed to make advances in developing highly authentic local indicators of sustainability (Burford et al., 2013a; Odii et al., 2020; Sethamo et al., 2019). Authenticity of social sustainability indicators is at the heart of their usefulness: if they are not authentic then local sustainability cannot be said to have been achieved. Inauthentic social indicators have low levels of salience, and cannot be representative of stakeholder interests, and in areas such as sustainable land remediation there are strong calls for such transparent links (Huysegoms and Cappuyens, 2017). In the case of the *WeValue InSitu* process, there is a transparent audit trail from the participants' discussions through to the final indicators developed from them, because it is a scaffolding process on which the participants build their own bespoke articulations, rather than a list to choose from. Example case studies are published e.g. in land remediation decision making (Odii et al., 2020), and in climate change adaptation village planning (Sethamo et al., 2019).

The *WeValue InSitu* approach started with an EU FP7-funded project called ESDinds (Podger et al., 2010) which used a pragmatic action-research design-based approach to develop a facilitated scaffolding process in a workshop format for local groups to crystallize their own shared values. The main outcome of any given *WeValue* workshop is the group's framework of linked statements of shared values, locally constructed (see Fig. 1), which can be concise enough to be used as formal indicator measures if desired (see, e.g. Burford et al.,

2013a; Odii et al., 2020). The usefulness of this approach is becoming more and more significant in sustainability: initially as a method for determining which shared values are active in civil environmental programs (Podger et al., 2010, 2012; Harder et al., 2014), and for monitoring and evaluating their effectiveness with high face validity (Harder et al., 2014; Burford et al., 2013a). But more recently shown to provide an important new method to elicit authentic social indicators that can also be taken forward as inputs into even-mechanical decision-making sustainability support tools such for land remediation decisions (Odii et al., 2020), or for localizing climate change adaptation plans (Sethamo et al., 2019) which is a very significant specific current global challenge for the UNFCCC (2018). The *WeValue* approach has been put forward as a more valid way to develop indicators for SDG4: Education (Burford et al., 2013a) and is also now being used in a major global international development project (on childhood stunting) as a new-generation participatory method which allows improved interface

with local populations (UKRI 2018). However, in all these uses it has only been delivered by the founding research team, because it is a practice-based design approach, and although the design process used in *WeValue* is standardized and reproducible, the skills to deliver it can only be acquired via apprenticeship at the moment. It is thus vital to develop a formalized re-conceptualization of the *WeValue* process which can communicate more efficiently to others how to deliver the process (portability), and for widespread scaling up: this is the second research question addressed here.

Further detail on the second research question, in transformational learning (TL), begins with an understanding of the crucial role of TL in both sustainable development and in adult learning. A core ambition of sustainable development is to meet present needs without compromising the needs of future generations (WCED, 1987), which is only possible by people acknowledging that current forms of human development are *not sustainable*, and that new pathways are needed to achieving balanced social, economic, and environmental goals (O'Brien et al., 2012), with "in-depth and comprehensive understandings of how societal transformation can be initiated, fostered and governed towards sustainability" (Boström et al., 2018 p. 4480). According to Regmi and Bhandari (2013), movement away from current (mostly economic) approaches to development requires a radical transformation of world views, capable of producing accountability, inclusion and responsiveness from its various stakeholders. Sustainable development can thus be seen both as a product of learning and a learning process in itself (Boström et al., 2018); a transformation of basic frames of references and shifts of perspectives of individuals and systems. In the 1990's, momentum grew rapidly for the development of systematic approaches of formal and informal education which could produce such transformations, and led to the establishment of the 2005–2014 United Nations Decade of 'Education for Sustainable Development' (UNESCO, 2004). Elements of learning affiliated with transformation of perspective were sought for Education for Sustainable Development (ESD) practices (Sterling and Thomas, 2006; Sterling, 2011), including critical self-reflection (Balsiger et al., 2017), critical-reflective teaching-learning experiences (Brunstein et al., 2020), transdisciplinary course designs rooted in real-world sustainability challenges (Probst et al., 2019), social learning, the role of experience and the development of sustainability competencies (Aboytes and Barth, 2020), synergies between formal and informal education (implying integrating practice and theory by linking external communities, teachers and student) and experiential learning (Robina-Ramírez and José-Amelio Medina-Merodio, 2019), reflections on values (Leal Filho et al., 2018) and autonomous thinking and some types of autonomous engagement (Tarnoczi, 2011). However, the inclusion of these or various other learning elements has not guaranteed TL production, and current studies of successful TL cases are descriptive, not predictive.

The same challenge is found in the field of TL research which centres on adult education (Taylor, 2008): the Transformative Learning Theory (TLTh) of Mezirow provides principles for *possibly* producing TL which have been used in scores of studies, but transformational learning is *not necessarily produced* when they are used, and there are still no prescriptive theories or approaches which claim to reliably produce it. As summarised by Taylor and Snyder (2012 p. 49) after systematic reviews of the field; "Though basic assumptions for fostering transformative learning have been accepted - for example, learner-centered teaching - there is a lack of a clear understanding of what it looks like in practice". There is thus an outstanding research challenge in TL to determine *what practices are explicitly linked to the production of TL*.

Several published papers report that the use of *WeValue* has produced 'transformations' of various types (Podger et al., 2012;

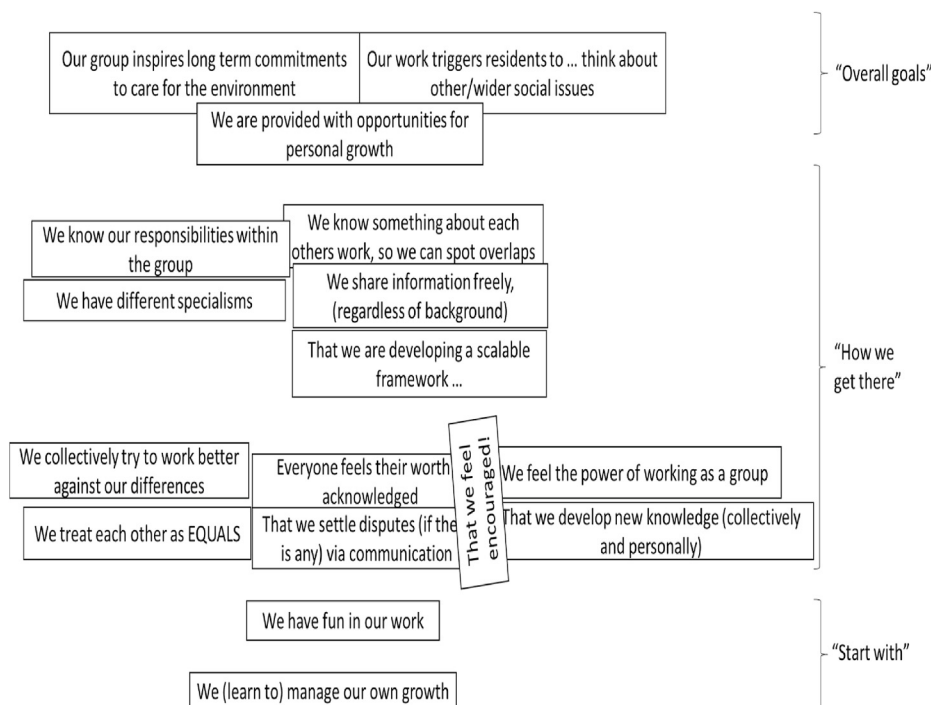


Fig. 1. An example of a framework of locally-constructed, bespoke statements of shared values-in-action, which were ‘crystallized’ using the scaffolding process of WeValue InSitu. This particular one was produced by participants in the case study presented here: they were junior researchers specializing in residential waste. The higher statements represented their overall goals; the lower ones represented what they ‘started with’, and the middle ones represented ‘how we get there’.

Burford et al., 2016-; Harder et al., 2014), including ‘transformational’ effects on students (Thoresen, 2017), and with Botswana village committees planning for climate change adaptations (Sethamo et al., 2019). A recent study concluded that WeValue InSitu can reliably produce TL, by summarizing the historic data and then rigorously analyzing a case via criteria of Mezirow (Harder et al., 2021). The determination of the characteristics of the WeValue InSitu practices which enable TL production is thus a research question of interest in TL.

In this study, the aim is thus to re-conceptualize the practice-based social indicator design process known as WeValue InSitu which has been observed to incidentally produce transformational learning, to simultaneously contribute towards two research areas: i) the identification of its sub-processes linked to the TL production, which can then be later linked to learning processes in education, and ii) formalized descriptions of those practice-based sub-processes, to allow explicit communication and thus transferability of the approach to meet demand for its applications in sustainability indicator field work.

3. Methodology

In order to reconceptualize the WeValue InSitu approach, a grounded empirical emergent approach (Charmaz, 2006) was chosen whereby a single typical case will be used for deep exploration (Yin, 2017). Transcripts from recordings of the entire process were analysed. The aim was to reveal linked sub-processes of the WeValue design-based ‘activities’ that can then be formalized, and thus it becomes very important to consider the degree of fineness of the analytical tool to be used. It is preferable that the finest possible micro-processes which can be identified are used, to first show up the ‘warp and weft’ of the WeValue processes, so that the sub-processes which link to the TL can be revealed like a tapestry pattern upon them, and thereafter conceptualized. There are only

four existing approaches that could in principle be used as an analytical framework for this purpose: they are considered in 3.1, and details of data analysis methods given in 3.3. In addition, even though the WeValue InSitu process is known to reliably produce TL in the formal sense (Harder et al., 2021) as set out by Mezirow’s TLTh, it would be wise to confirm that the particular case studied did in fact produce it. Pre- and post-event interviews were thus undertaken. The method to prove TL occurred is given in 3.4, and the case selection is outlined in 3.2.

3.1. Choice of an analytical framework

The chosen analytical framework must be appropriate for the data source, and research question, and below a justification is given by outlining the character of each and thus their alignment.

The WeValue InSitu approach was developed through practice-based, research-through-design methods (Harder and Burford, 2018), which means the designers currently conceptualize the process in terms of the named activities they deliver (Brigstocke et al., 2017; Moreno et al., 2020): Activity Stage 1 is a ‘warm-up’, using photo-elicitation of values-based storytelling (where participants select photos that resonate with what they find valuable, meaningful and worthwhile about being part of the group and then verbally present them). Activity Stage 2 triggers further, deeper, resonances by reading and reflecting on a uniquely pre-constructed list of ‘Trigger Statements’ (built by the designers from related phrases used by other people from a similar culture). Activity Stage 3 is the main place to develop inter-subjective discussions to ‘crystallize’ collective understandings (of what is meaningful about their activities), initially stimulated by Trigger Statements chosen, and then also by each other’s comments. And Activity Stage 4 is the stage where the final statements are linked to each other in their natural framework (see Fig. 1). Such design terms are not well-defined nor easily linked to mainstream teaching or learning

concepts. A recent study attempted to more formally conceptualize the WeValue approach in terms of Reflective Practice processes, but that analytical framework did not reveal well-defined or useful patterns relating to transformations (Moreno et al., 2020). This was reportedly because Reflective Practice processes are broad, and span large sections of conversations: it would seem a more fine-toothed analytical tool is needed to reveal the finer sub-processes.

Mezirow's Theory of Transformational Learning (TLTh) (Mezirow, 1990) is another candidate framework, which includes detailed stages of transformational learning. However, they are also rather coarse-toothed: a recent full analysis of WeValue using TLTh stages (Harder et al., 2021) did not reveal sub-processes which are any finer, or easier to communicate, than those already in use by the WeValue *InSitu* designers.

Two mainstream theories of learning which include a mechanism of crystallizing, converting, or 'translating' tacit knowledge to explicit knowledge were considered candidates because of the repeated reference in WeValue publications of a 'crystallization' of shared values by participants (Podger et al., 2012, 2015; Burford et al., 2013a, 2013b, 2015, 2016; Harder et al., 2014; Hoover et al., 2015; Brigstocke et al., 2017). These are the Personal Knowledge Theory (PKTh) of Polanyi (1962), and Knowledge Creation Theory (KCTh) of Nonaka (Nonaka, 1991, 1994). Nonaka's (1995) SECI translation processes are very coarse-toothed, which made them unhelpful here. The PKTh concepts manifest at more of a micro-level than any of the others – indeed at a very fine level. They comprise micro-mechanisms of thought involved in converting tacit (intangible, unspecified) forms of knowledge (e.g. shared experiences and values) to their explicit forms as with the case of connoisseurship (Noel et al., 2021). Thus a synthesized analytical framework of those micro-processes was used (Polanyi 1958, 1961, 1962, 1966, 1967) to analyse the full transcripts of Activity Stage 3 of a single WeValue *InSitu* event (to reveal sub-processes related to production of transformative learning).

Fig. 2 is a schematic representation of the micro-processes involved which is described thus. An individual might move in time through these micro-processes across domains of Tacit and Explicit Knowledge: an External Stimuli (ES) is first Assimilated (As) and the first meaning that the person makes from it is called the Primary Denotation (PD); the person will then Reflect (R) on what language is appropriately affiliated to that denotation, and begin Groping (G) for suitable words to ReOrganize (ReO) the primary denotation: they then might Designate (Ds) (i.e. name it), and then 'Read the Result' (RR) as an end point. If not satisfied with the 'Read Result' (RR), the person might then ReInterpret (Rel) the stimuli or the meaning by Adapting (A) and groping further, until a more

satisfactory result is read as shown schematically in Fig. 2. This set of microprocesses comprised the analytical framework used to deconstruct the discussions in the WeValue transcript data, as illustrated in Table 1.

3.2. Case selection

It was needed to obtain transcripts of an otherwise unremarkable, standard WeValue *InSitu* event where TL production was perceived by the facilitator to have occurred, and ideally where there was a possibility for a post-interview to confirm the TL, and whether it led to a confirmed behaviour change. Researchers (including our author MKH) who work together with large numbers of WeValue applications provided such a case: it is not claimed to be representative but rather 'not untypical' of the portfolio of data on standard WeValue *InSitu* events. The following aspects were noted to sometimes cause anomalies and thus avoided in the case selection: that the TL produced seemed less strong in cases where i) any participants arrived late; ii) where the event was forced to be split into two sessions or halted unexpectedly; iii) where there were more than about 12 participants; or iv) when language translators were used for one or more participants.

The ethical approvals included non-specific areas of exploratory considerations of the data in order to develop knowledge of values-based approaches generally, which covered our topic, and the informed consents obtained from participants included a post-event focus group interview, as well as scope for optional further post-event individual interviews by future mutual agreement. The participants were told their shared values would be 'crystallized' in their own bespoke terms, potentially helping future collective communication, and clarification of group vision and mission. They were not explicitly told they might undergo 'transformation' in TL terminology, and no 'nudging' was planned: the facilitators saw the process only as a scaffolding which assisted the group to better articulate shared values which already existed in their shared actions. The ethics approvals covered this approach. An emerging ethical issue which deserves future consideration is the emotional impact of the self-realization that sometimes occurs alongside the TL outcomes that are documented here.

3.3. Data analysis methods

3.3.1. Mapping the micro-processes

The data analysis method had to be able to show the finest possible processes going on in the WeValue *InSitu* approach. Every line of the transcripts of Activity Stage 3 was thus closed-coded

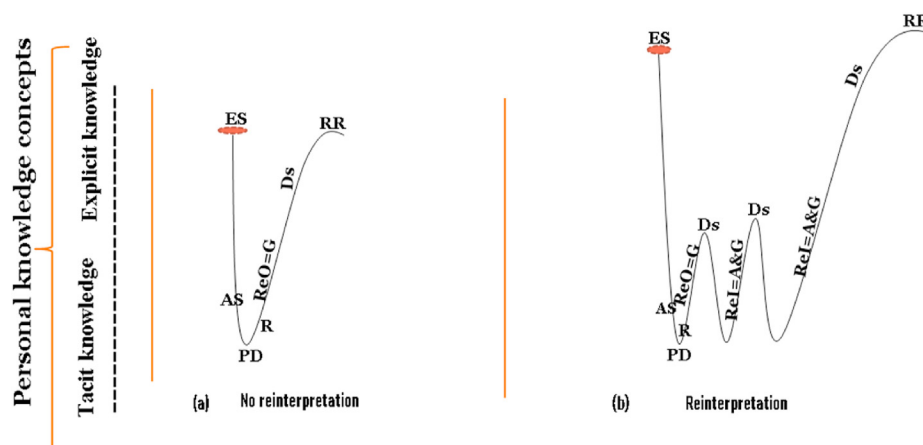


Fig. 2. Schematic representation of the chronology of the Personal Knowledge Theory micro-processes involved in the translation of tacit to explicit knowledge.

Table 1

Thematic analysis of extracts of three Discourses where Transformational Learning (TL) might have evolved, in Activity Stage 3 of the WeValue InSitu event. The closed coding used a formalized framework of the micro-processes of the Personal Knowledge Theory (see 3.1).

Extracts from a <i>WeValue InSitu</i> event	Analysis: PKT concepts; WeValue observed sub-processes; and comments
Discourse 2a	
PPT3: I think people should be more... for me, people would be more careful (about the environment): Rel so creating awareness in them and letting them understand - just like she said with the teaching - let them understand that this is the relationship we have with the environment.	Internal stimuli Ds
FAC: (speaking to PPT4) How does that relate to what you said? Because PPT3 is saying the awareness, working on the awareness, is quite important, and the implication is, because that has a longer-term effect, or it is transferred: something like that.	Calling the participant's attention to what has been said since PPT3 made reference to her earlier transposition.
PPT4: Yeah, I think it's almost a summary, but it is not so detailed...let's say if I, I am aware of the connection with the environment, or the environment here is not important to me ...and, and our group, yah, but the awareness is mmmh how I can trigger people to do something to affect ... Ds	Evidence of reflection ReO -G
FAC: Yeah, yeah, could you give, give me your proposed statement then?	
PPT4: Uuuhmm say, "group members are aware that their activity and their activities in the ..." how about, how about, (speaking to group members) "group members are aware that their activities involve academic and in practice, or even here in the field, will make the residents or other scholars know what ammm or more about the environment..."	Refocusing (RF) so as not to lose sight of the intended goal Rel R on going
G & Ds	
FAC: So, is it important to you, first, that the group does know more (about the environment): and then can you look at this idea as two separate statements?	
PPT4: Mmmmh, so for me first, I am aware then we are actually trying to achieve that	
FAC: To achieve awareness in other people?	
PPT4: "Our activity will influence other people to start to think about ..."	Disentangling (DE)
FAC: Okay now we have another idea that if we are first aware of the environment then our activities should move towards helping other people to be aware... something like that?	
PPT4: Yes	Rel
FAC: Okay? So can you propose, can you propose the first statement? For me, I think there are two things...	Ds Challenge (C)
PPT4: Yeah, yeah	ReO leading to a Ds
FAC: Okay, what's the first statement? It's important to you that...?	Reflecting back words (Rbw)
PPT4: Aaammmm "our group members are aware that our group's activity can contribute to the environment"	Affirmation RF
Discourse 2b	
FAC: "It's important that our group members are aware of" or...are we going to settle about the impact on the environment first? Or what?	DE Affirms both question and statement
PPT4: "On the residents..." aahh I think to include the residents before the environment, so...	RF
FAC: Okay so "our group members are aware of its impact on..." how about "the impact on the environment?", hold on for a second... aaamm... "The environment directly and via residents". How about that - but we can change it, we can change it!	Rel leading to a RR
"our group members are aware of its impact on the environment directly and via residents' behaviour changes..."	
PPT4: I agree, but...!	Rbw C
	ReO
	Ds
FAC: Is that what is important to you? First we will talk about that, but how do other people (in the group session) feel about this? Maybe you may say it's not this, it's this... because we're gonna keep changing this statement until you are happy with it! And then we will put it on the table and we will do another one.	Rbw
{silence ensues}	RR
FAC: PPT2?	
PPT2: {Begins to mumble some words}	Affirms it but needing to clarify something
FAC: So it's... "our group members...". It is important to PPT4 that "...?"	
PPT4: PPT3 proposed something {motions to PPT3}	
FAC: Okay PPT3, what do you think, we need you here! "it's important to you that our group members are aware of their impact, environmental impact, directly and via the residents that we influence...?"	RD and seeking Clarity
PPT3: I think that's it.	
FAC: Right ...so this is about awareness: it's important to these guys that we are aware of our impact, our influence on the ahhh on the... on the environment...	
Discourse 2c	
PPT4: But for me the focus is on the impact we can influence...	C and Rbw
FAC: Okay that's fine; that's fine. If we wanna change the emphasis, we can (even) write a new one (a new statement). Yeah, so are you suggesting that other people (in the session) might have a different feeling about this?	C and Rbw
PPT4: Perhaps when someone else just looks at this statement, they will think about the environment.	
FAC: Oh, but you are not talking about, say, just the environment, you mean general impact on the residents: you're talking "environments" in brackets: it is only one of several ideas... or is this about	

(continued on next page)

Table 1 (continued)

Extracts from a WeValue InSitu event	Analysis: PKT concepts; WeValue observed sub-processes; and comments
the environment...?	Ds or RR
PPT4: Yes, I think we are doing waste management work here, so we are focusing on that... I think that we do that most effectively... but I think the environment is just the... perhaps it's a <i>start</i> when people are triggered to care about the environment... perhaps they care more about some other things and...	ReO after assimilating and reflecting on the just RR
FAC: Like what? roughly	Rbw
PPT4: Other social issues...	
FAC: So how about if you say, that, it is also important to you that your group's waste sorting work has a knock-on effect of <i>raising awareness that -wow - with other things</i> people value... something like that...	Rel
PPT4: Or starting from the environment	Ds
FAC: Okay, so, but is it a knock-on effect, or a spill-over that you are particularly..., are you saying this is important to you? because we are talking here today: we are talking about the things that are important to us	Rbw
PPT4: Eeem " our group members are aware of their impact via the residents, starting from the environment "	
FAC: But there's two things there: one is our impact on the environment, and the other thing is ...	Rel
	Ds
	C ReO leading to a Ds
	Rbw
	Rel... Ds Rbw RF
	RR
	DE

Note: Other discourses related to the TL development are provided chronologically in the Supplementary Materials.

(Saldaña, 2012) against the PKTh framework— without any consideration of their relative ordering, and with the proviso that if a line did not fit any PKTh concept, or fit it well, it would be noted separately. (Activity Stage 3 is where the discussions and interactions of participants occur: Activity 1 and 2 are monologues and quiet reading respectively and thus not relevant here.) Two researchers analysed the data separately, and then resolved any (very few) differences in interpretation. The results were presented to a third researcher, independent of this study, for challenge and a fresh viewpoint.

3.3.2. Coding the content for themes

After the processes had been coded and analysed as in 3.3.1, the content of the discussions was coarsely coded thematically, using open coding and grounded approaches (Charmaz, 2006; Corbin and Strauss, 2014). The purpose was only to provide a rough map of the dynamically changing topics. Then, the topic of the candidate TL obtained from the method described in 3.4 was searched for throughout the coded transcripts, as were any topics found leading into or out from discussions of it: these were identified, and mapped out overall, to be used in building a conceptualization of the linked WeValue InSitu sub-processes which produced the TL.

3.4. Method to confirm that TL occurred in this case

In order to identify that transformational learning had occurred and in what topic area, the transcripts of the pre-event and post-event interviews were inspected to look for evidence of shifts of perspectives by any of the participants (see Fig. 3). Where any candidate TL was found, its topics were searched for in the

transcripts of the entire Activity stage 3 of the event, initially with respect to the grounded coded themes obtained via 3.3.2, and then within the full detail of the discourses. All of the relevant discourse going into and out of any discussions of the topics were identified, including noting of the Mezirow (1990; 1991) processes of dis-orienting dilemma and critical reflection within a rational discourse. Hoggan's (2015) transformative learning outcome classifications (worldview, self, epistemology, ontology, behaviour and capacity), and his three aspects of a learning outcome (depth, breadth, and relative stability) were considered in the further justification of the TL occurrence. All the discourses relevant to the TL were then analysed with respect to the process themes of 3.3.1, to try to understand the linkages and pathways between them, and to develop a conceptualization of them. Finally, the entire WeValue InSitu transcripts and outputs were examined with respect to the preliminary conceptualizations, and presented to an independent researcher for critique.

4. Results

4.1. Actual case chosen

The chosen case event took place in September 2018 involving six junior academics in a university research group specializing in residential waste who had been working together on a daily basis for 1–4 years. Their stated motivation for requesting the event was a common one: they wished to reflect upon their values and activities. The WeValue facilitators reported that during the event one of the group members clearly shifted away from a perspective held at the start, denoting possible TL.

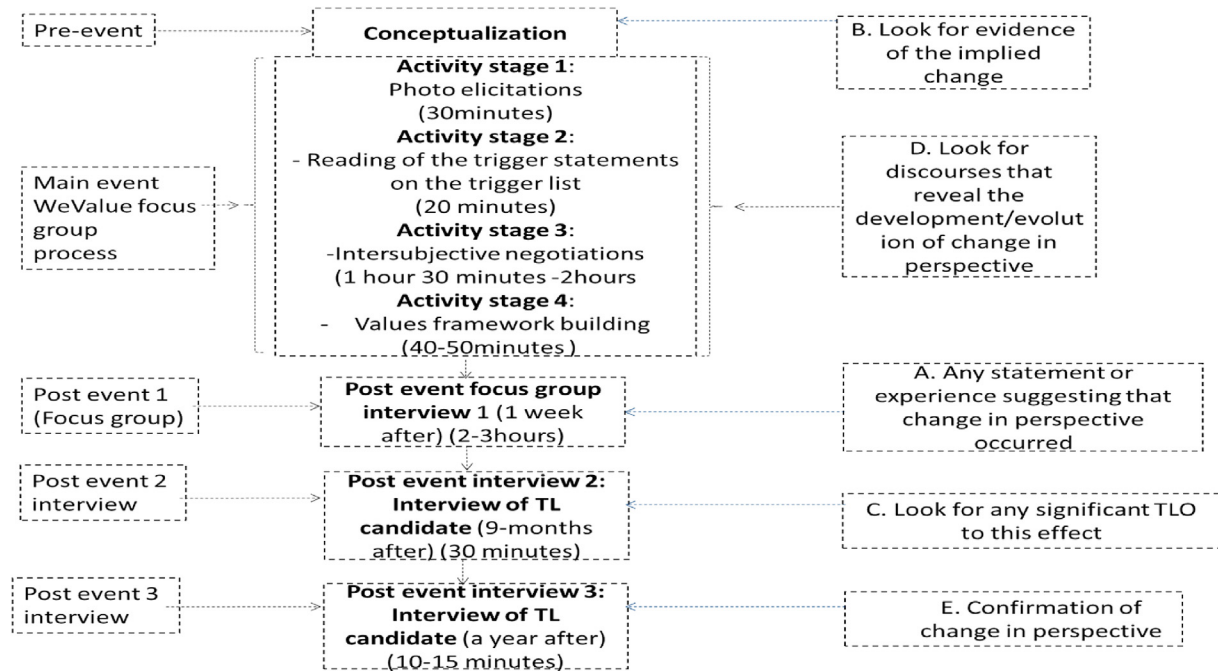


Fig. 3. The chronology of the WeValue InSitu Activity Stages, post-event interviews and pre-event 'group conceptualization'. The right side depicts the chronology of the analytical steps.

4.2. Identification and tracing of a candidate TL topic

The level of detail given below is necessary in order to provide convincing evidence of links between WeValue and formal TL concepts. (Although confirmation that TL occurred is of interest to many readers, it is a minor contributor to the results presented in this paper, and so this study provides only a summary below, and place a more full justification in the Supplementary Materials. A separate study exists which focuses on the evidence for reliable TL outcomes from the *WeValue InSitu* process (Harder et al., 2021).

In a post-event interview, Participant number 4 (PPT4) described that she now considered it important to influence other social media users about the benefits of waste sorting (for recycling). Prior to this transformation in behaviour, she did not consider it necessary to actively correct wrong impressions on recycling made by social media users (Post interview 2 Line 50–55). She also mentioned the feeling of a sense of guilt when she does not carry out some pro-environmental activities. Noting that this appeared to be a shift from her pre-event statements, where her prime concern was to 'help contribute to society' and the environment was not mentioned, these topics were marked for retrospective detailed inspection throughout the transcript, *after the analysis of the WeValue event processes* as described below in 4.3.

PPT4 made several comments in total which strengthened the interpretation that her perspective had shifted, such as that she would not have picked a trigger statement on the environment (line 271–272 Post-interview 1); the environment was not in the priority of things to be considered by her (line 14 of Post-interview 3); and she would not have considered the environment before anything else (line 18 of Post-interview 3).

PPT4 was found to have encountered disorienting dilemma in several places. First, during the photo elicitation stage of participant monologues (no discussions), some of the group members expressed their (differing to her) opinion of the importance of the environment in their opinion different views to her: she even stated in Post-interview 1, Line 285, that it was during the photo

elicitation stage that she began having small thoughts (considerations) about the environment as a contribution. PPT4 further confirmed (Post-interview 1, Line 304–305), that she did not initially feel inclined in Activity Stage 2 to pick trigger statements in relation to the environment but that she did finally pick two, after being triggered or disoriented by the list of statements provided for individual reading, which included some about the environment. The transcripts of Activity Stage 3 discussions indicate she is further disoriented by fellow group members as she critically reflects verbally on their opinions, which have some small overlap, but are different, to hers. In her 'designations', it is clear that the environment was still not of key interest to her at this point (Line 71–75; 136; 289–290 of Activity Stage 3). Rather, PPT4 counters by stressing her interest in the influence the group members were going to make on the residents to reflect on other social issues (beyond recycling). When the facilitator redirects the group to reconsider and reconcile their ideas with a previously, partially-articulated group statement that had been 'parked' (not completed), the group took themselves through a further process of meaning-making and meaning-checking that gave rise to the final 'reading of the result': that caring for the environment was something important to the group. The transcripts show that PPT 4 actively contributed to that reconciliation and final resolution of the group's shared value statement on the environment. The Mezirow (1990; 1991) criteria (disorienting dilemma and critical reflection (see Fig. 4 for proof) within a rational discourse) are thus met: TL has been shown to have occurred. (Full details are given in the Supplementary Materials.)

4.3. Analysis of the micro-processes underlying the WeValue event

Before, and separate to, analysis for TL topic content (3.3.2), the transcript of Activity Stage 3 of the event was coded for *micro-processes* (3.1). The transcripts relate how participants were asked to put forward explanations of why they found their chosen Trigger Statements (TS) to be relevant, and encouraged to have inter-

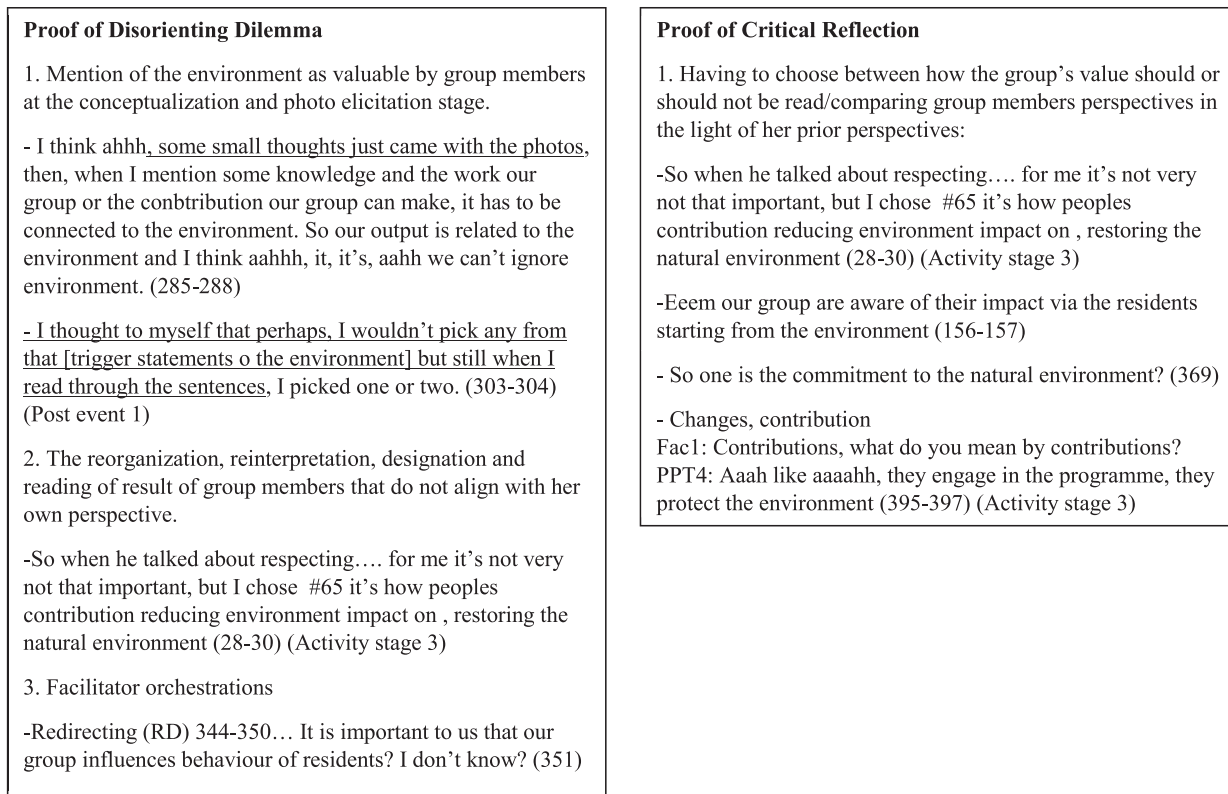


Fig. 4. Evidence of disorienting dilemma and critical reflection found for Participant 4 in the transcripts of the WeValue InSitu event.

subjective discussions, which typically led them to collectively consider natural clusters of 2–4 related Trigger Statements through re-phrasing, consultation, and counter-illustrations. The facilitator then encouraged participants to work out how to articulate new or adapted statements that best represented their negotiated meanings, and to write down these bespoke new, concise, Values Statements on paper as they emerged, and place them at the table's centre. When there were no new topic areas to explore, the workshop was wrapped up with the participants being asked to move their Values Statements around physically to explore and determine how they were connected to each other, and in that way producing a final Framework of their shared values (shown in Fig. 1). (The possibility of noting some were unshared was left open at all times.)

The entire transcript was coded using the framework of the PKTh micro-process concepts, which worked very well, producing good inter-rater reliability. Table 1 shows coded transcript extracts which relate to three Discourses identified to be involved in the evolution of the specific Transformational Learning (TL) which occurred, and Fig. 5a shows the chronology of the micro-processes schematically, across those Discourses. (Attention was paid here to PPT4's reorganization and reinterpretations of her primary denotations and the facilitator involvement. The full discourse details, involving other participants' reorganizations and re-interpretation of their primary denotations are provided in the Supplementary Materials.)

The detailed analysis laid out in Table 1 shows that as PPT4 begins with talk about what was important to her about her group, she uses clues Assimilated (As) from the WeValue Trigger Statement as well as her own vocabulary, and ReOrganizes (ReO) her Primary Denotation (PD) into another version of itself, which is here referred to as Designation (Ds) or the Reading of the Result (RR), as

illustrated schematically in Fig. 5a. As she Groped (G) for concepts during Reorganization (ReO) and Adapted (A) and Groped for concepts during ReInterpretation (ReI), she was either considering or discarding concepts. These were evidences of Reflection (R) of her previous Designations (Ds) and or Read Results (RR). At every point when the participant pauses and is aware that she has arrived somewhere in discourse, it means she has 'Designated her denotation'. If the Designated (Ds) denotation is unclear - which often-times is the case - then the participant ReInterprets her PD and 'Reads' a more precise 'Result', which is here referred to as a RR (Reading of the Result).

4.4. The micro-processes revealing WeValue sub-processes

The crux of this paper is described here: the fine-toothed micro-process analysis reveals broad patterns of meaning-making occurring as sub-processes within WeValue InSitu, as shown in Fig. 5b. These are meaning-making/meaning-checking cycles, where participants are triggered to access and consider experience-based ideas, to negotiate their meaning while still in the tacit space via draft crystallizations (articulations) and consideration of counter-experiences, and thus move into higher explicit space and arriving at explicit crystallizations (i.e. draft articulated statements). These are checked against the intended meaning, and if not satisfactory the participants go through further cycles of meaning-making until they arrive at satisfying, final, explicit crystallizations (articulations) (see Table 1) like, "Our work triggers residents to think about other social issues generally", and, "Our group inspires long term commitment to care for the environment". During this process of meaning-making and -checking, the participants get closer and closer to a clear final explicit crystallization of their intended meaning: we denote this a 'crystallization cycle'.

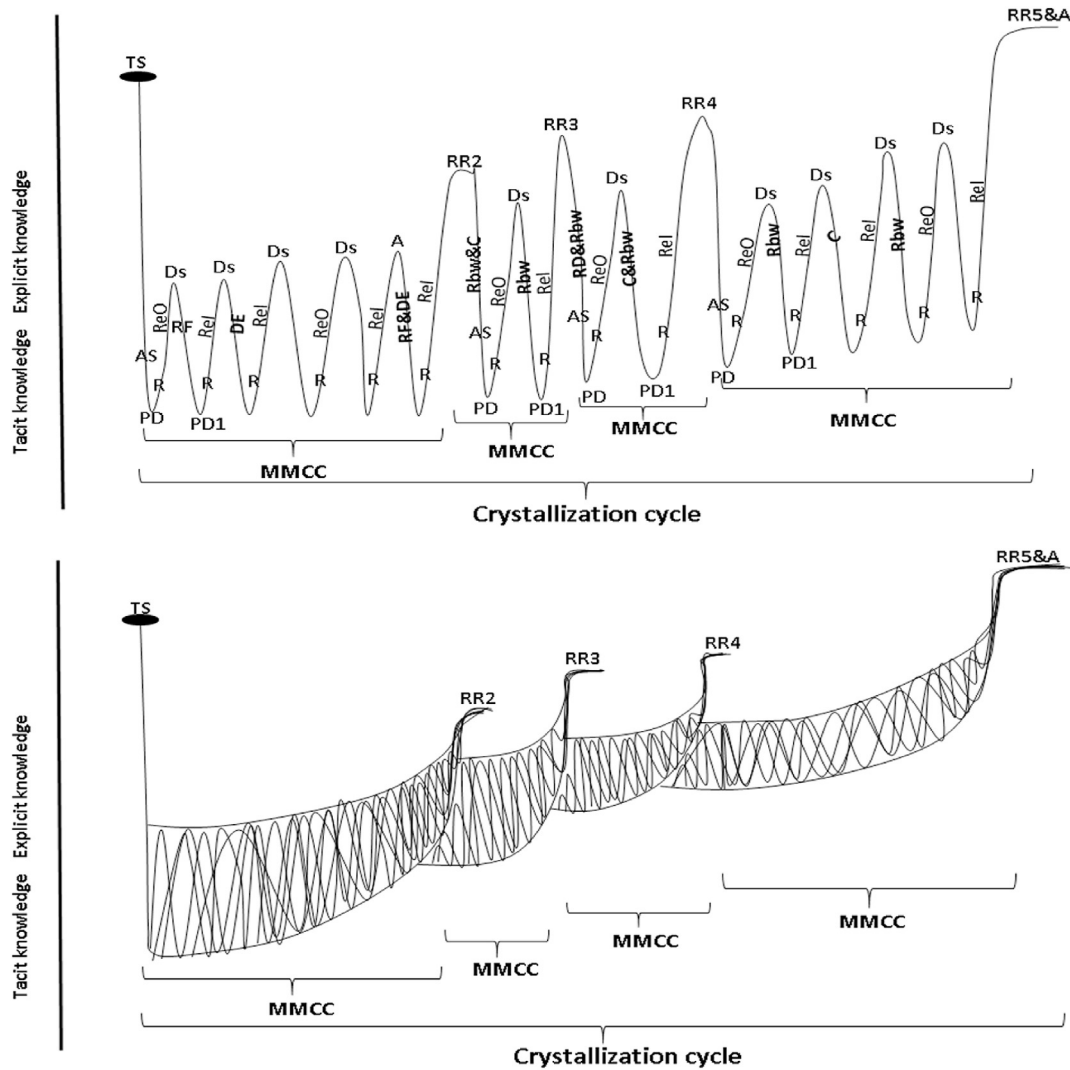


Fig. 5. a) Schematic representation of the PKTh micro-processes in verbatim Discourses 2a,b,c of one topic in the WeValue event, starting with the Trigger Statement, TS. The horizontal labels denote the micro-processes in 3.1 and 4.3: the emboldened ones denote the deduced actions of the facilitator used to move the discourse on: RF- ReFocusing, DE- DisEntangling, C-Challenging, RbW- Reflecting back Words and RD- ReDirecting (see 4.5). The other labels are as in 4.4. b) This figure illustrates the key finding of this paper: the revealed sub-processes of WeValue InSitu: broad cycles of Meaning-Making (entering tacit space and autonomous negotiations) and Meaning-Checking (interim Read Results checked for intended meaning) culminating to a Crystallization Cycle.

4.5. Identification of recognizable facilitator roles

The analysis also – unexpectedly - revealed clear patterns of different facilitator action types, termed here as ‘orchestrations’ (in the sense of the facilitator guiding the group along th scaffolding process while they make their own discoveries of meaning). Each occurrence is indicated on Fig. 5, and five types are identified. For example, the transcript analysis begins a few minutes into Activity Stage 3 with the facilitator gently *Challenging* (C) participants (see transcripts in the Supplementary Materials) to illustrate further why participants’ trigger statements resonate. Often, when participants are gently challenged, they then bring in a new idea that was not previously in any earlier designation.

Second, *Redirection* (RD) of participants to go back to a discussion that was previously left hanging can cause participants to see and question their line of thought (see discourse 2b). Third, *Refo-cusing* (RF) directs participants to stay focused – not stray - on a current issue until they are able to Read a precise Result.

Fourth, the facilitator *Reflects Back* their own *Words* (Rbw) to participants in response to their denotation (Ds or RR), asking for

further clarity, precision and/or reason. This often causes several Reinterpretations as the participants become more and more precise in their explications until they have a Read Result.

Finally, our micro-analysis illustrates that the facilitator helps the participants clarify and *Disentangle* (DE) their complex statements (see Table 1: in 2a and the end part of 2c). In the Supplementary Materials, illustration and further clarifications are provided on a given table of Read Results #1-#5 (which are being used for meaning checking) which are not yet stabilized Read Results; and then Read Results #6a and #6b have been disentangled and made clearer.

Fig. 5b clarifies the role of these facilitator orchestrations: they facilitate the participants to focus on their meaning-making within a topic range, which is centered on discussions of shared experiences more in the tacit space, until a topic is ready for draft articulations. Then gentle challenges are used to assist participants in their meaning-checking, as they gradually articulate their meaning more explicitly. When complex topics arise, the facilitator directs their disentanglement into manageable strands. It is noted that the overall effect of the WeValue cycles of meaning-making and

meaning-checking is to lead the participant to become self-critical of their perspectives in the light of reflections of their other points of view, or cues from other group members, and more towards resolution of meaning.

This analysis also implies that a very specific type of transformation - a “self-awareness/realization transformation” - is occurring; a transformation that is linked to the increased clarity and shift in a person’s own tacitly held knowledge. This type of transformation is somewhat in agreement with one of Hoggan’s (2015 pp.10) categories of transformative learning outcomes ‘self’. It is a situation where PPT4 experienced changes to self with regards “sense of being situated in the world” - the value of ‘caring for the environment’; “having an increased sense of responsibility”- towards caring for the environment and being engaged in ways to see to it that others do same; where PPT4 has now gained greater mastery over herself “feeling enabled to engage consistently in the world, including but not limited to the concept of critical consciousness”; and finally where the personal narratives of her past and present provide basic evidences that a shift has occurred. This is also consistent with a statement by Mezirow (1990) that TL can occur when “uncritically assimilated meanings” are transformed by reflecting on one’s own premises.

5. Discussion

The motivation for this study was the need for a reconceptualization of the *WeValue InSitu* process beyond its design principles, for two objectives: first, to identify sub-processes which are contributing elements for producing TL, and secondly to more formally describe those sub-processes so that the *WeValue* process can be more widely communicated and taken up by practitioners keen to apply it to a variety of sustainability scenarios where social indicators are currently weak. Below, the new conceptualization is set out in 5.1, and then set out its relation to TL and sustainability studies in 5.2.

5.1. Re-conceptualizing *WeValue InSitu*: a contribution towards TL

The findings show how *WeValue InSitu* can be reconceptualized from its original design-based ‘Activity Stages’. The fine-toothed micro-process analysis (Fig. 5a) reveal sub-processes of meaning-making and meaning-checking cycles (Fig. 5b) occurring in Activity Stage 3 of the *WeValue InSitu* process, involving five types of facilitator orchestrations (Fig. 5a). Sets of these create a ‘Crystallization Cycle’, where participants reach a satisfactory, final crystallization of their intended meaning for one topic. These results suggest the following detailed reconceptualization of the *WeValue* process.

Activity Stage 1: Photo Elicitation can now be viewed as where participants are accessing their own individual *tacit areas of experience*, telling stories which are illustrative of the *more-tacit concepts* they wish to share with others, and thus *implicitly starting to create links* between spoken articulations and sharable experiences. In Activity Stage 2, individuals read and choose explicit written Trigger Statements which ‘resonate’ with their more-tacit experiences: they are in fact constantly referring the words to various experiences and feelings in order to make these choices. (The unique construction of the Trigger Statement list, especially when localized, is considered to play a key role in the process at this stage, and deserves further study.)

Activity Stage 3 can now be conceptualized as where participants are ‘sent’ to *deeply-tacit experiences that they begin to communicate*, often groping for words and rephrasing and revising their articulations to do so. At this point the meaning-making is focussed on exploration of their more-tacit knowledge, and it

seems that all the participants are effectively doing this by proxy while listening or engaging in an exploration of experiences. The facilitator encourages inter-subjective discussions by reflecting back words (RbW) and gently challenging (C) participants to actively stimulate each other’s meaning-making, in manageable parts. They thus borrow, stimulate, challenge and clarify ideas with each other, making use of explicit words - while mentally still considering more-tacit experiences and actions they share knowledge of. Ideally, the facilitator will ‘keep’ them collectively focussed and re-focussed (RF) until they have finished exploring the concepts that have arisen in a particular topic. But whenever the discussion moves into more-explicit explorations of intended meaning in words, which is here termed *meaning-checking*, the facilitator assists the group, as a set of individuals, to craft and finalize short statements of the concepts - which are written onto paper and placed in the centre of the table. Occasionally, there is an avalanche of too many related concepts, and the facilitator needs to help participants ‘park’ some for later or further consideration. Sometimes participants get ‘stuck’ on clarifying a given concept: again, the facilitator can help them ‘park’ it until other points are disentangled (DE) first, and then redirect (RD) the participants to revisit parked conceptions (which could also reveal and add new knowledge to previous interim read results (RR)). The cycle of meaning-making and meaning-checking is then repeated until there are no further concepts of perceived importance to the group. There seems a natural feeling of ‘completion’ at this point: participants exit their mental focus on remembered experiences and return to ‘normal’ everyday discussions as the facilitator closes the session.

The *WeValue In-situ* process can thus now be described as a series of facilitated cycles of meaning-making (more-tacit focus) and meaning-checking (more-explicit focus). Each cycle provides a pathway for the participants to arrive at Read Results - interim statements representing the intended sense and meaning of each topic in hand which is here referred to as meaning checking; and Final Read Result (FRR) represent a clear, concise and crystallized sense and meaning of a topic that have gone through several circles of meaning making and meaning checking (see Fig. 5b). When Final Read Results (FRR) are produced, it is denoted a ‘crystallization cycle’. Such FRR statements are not only crystallizations (articulations) that the participants are satisfied with; they are also a) disentangled, b) valid relative to each other, c) using language that the participants are comfortable with, and d) in appropriate form for communication to others.

The above conceptualization allows us to communicate to the facilitator their role, more clearly: *they should focus on moving the participants towards achieving the specific characteristics a)-d) of the final statements, and when i) uncertainty, ii) confusion, or iii) lack of consistency is seen in the articulations, then the five orchestrations are used to move forward. On the other hand, the participants are to be kept focussed on something else: meaning-making of their more-tacit experiences (what Polanyi (1967) calls ‘sense-making’); and meaning-checking (what Polanyi (1967) calls ‘sense-giving’) during more-explicit articulation. And those cycles build into a final, satisfactory, explicit statement of participants understanding of an aspect of themselves, in each crystallization cycle. These stepped cycles represent steps of increased self-realization.*

Note that these elements are still not claimed to be actual Transformative Learning; only as contributors towards it. The pathways to actual learning were not studied here, only the existence of the elements in Activity Stage 3 which contribute to it. There are clearly more, albeit less major, within Activities 1 and 2.

The above conceptualization of the *WeValue InSitu* process and the role of the facilitator now make it possible to describe more

explicitly the *WeValue InSitu* process beyond its design activities. This will allow production of a formalized methodology and manuals for training of new facilitators, and thus for the portability and scalability for applications in sustainability in the field.

5.2. Contributions to the fields of TL

This case study has revealed that *WeValue InSitu* process contains sub-process elements which contributed to the particular transformational learning it produced: elements which systematically built up higher levels of self-realization in the participants. Knowledge of these specific sub-processes will assist in *reliably producing* (this type of) TL, which is in demand for both the direct outcome (TL occurring), and for educational research and pedagogy (understanding the learning mechanisms involved). The approach can be used to design systematic series of studies investigating current topics of interest: differences in group types, learning environments, durability, connections of these learning mechanisms to other types of learning, and influences of the facilitator. Such series of systematic studies have not been seen before: this more-precise conceptualization of *WeValue InSitu* sub-processes above will allow them to take place.

The meaning-making, meaning-checking sub-processes can be related to other TL and ESD concepts beyond Mezirow's broad processes of disorientation and critical reflection. Participants accessed deeper-than-usual concepts that were values-related (this relates with [Leal-Filho et al.'s \(2018\)](#) reflections on values) and linked to experiences (which could be seen to be in line with [Aboytes and Barth's \(2020\)](#) 'role of experience'; and [Brunstein et al.'s \(2020\)](#) 'critical-reflective teaching-learning experiences'), and then collectively made sense ([Polanyi, 1967](#)) of them through inter-subjective exchanges which were focused on those experiences. Such deep meaning-making required reorganization of some existing notions, which created superb opportunities for self-realization. Self-realization is one of the several processes and outcomes generally associated with TL, and this study shows that the *WeValue* process provides participants 'a suitable space' (which resonates with [Balsiger et al.'s \(2017\)](#) proposal that ESD needs a safe space to achieve TL) to think independently as well as inter-subjectively of "what is 'valuable, worthwhile and meaningful' ([Burford et al., 2016](#)) to them about their group's shared values. Larsson and Holmberg (2018 p.4418) refer to this type of process as "autonomous engagement in real world issues as meaningful." The participants were able to engage and reflect on concepts of their own values, but stimulated by what other members were saying. Such autonomy of thinking (engagement) can lead to self-critical realization following what [Sterling \(2011\)](#) conceptualizes as "seeing ones world view" that is, to be critical of one's own view in the light of the other perspective(s) and reformulating it to incorporate a new perspective ([Mezirow, 1990, 2000](#)). The *WeValue InSitu* process did not only enable PPT4 to explicate and clarify her values in the light of other participant's perceptions of their group's value, it made her 'to see' ([Sterling 2011](#)) and reflectively reformulate her own perspective in the context of her group's shared values.

With regards learning within the *WeValue InSitu* process, as participants crystallize their shared-values and experiences, they are experientially learning to access and be critical of theirs and others tacit shared-values and make explicit the same using concepts available to them during their individual cycles of meaning making and checking within the crystallization cycles. This is in agreement with [Robina-Ramírez and José-Amelio Medina-Merodio's \(2019\)](#) submission of experiential learning as a pathway to transformational learning.

The contribution here of *WeValue* to the nurturing of transformative learning is the method of attaining this self-realization: via cycles of meaning-making and checking within Crystallization cycles/Steps – using the standard *WeValue InSitu* activities and materials. The process has already been shown to be transferable in various publications: now that it can be formalized, other TL researchers and practitioners will be able to try out these linked *WeValue* sub-processes to see if they can reliably produce TL. This could either be done within the context of the rest of the *WeValue* process, or experimentally applied to other approaches to TL.

Furthermore, the *WeValue* facilitator orchestrations identified here may be of use in the wider field of TL as ways to enhance TL production: keeping participants in the zone of ReInterpretation and further Re-Organization of their denotations until they are confident and more satisfied in themselves ([Polanyi, 1962](#)) about their Read Results. This process is consistent with [Brunstein and King's \(2018\)](#) assertion that reflection and TL must be prompted for the production of individual and collective change towards sustainability, and [Lange's \(2004\)](#) portrayal of the role of disruptive elements to cause reflection. What is particularly new from this study is the *connection* of the role of accessing experiential knowledge/tacit experiences as part of those steps of disruption, reflection and self-realization.

6. Conclusion

This study has successfully provided a new conceptualization of the mechanisms for Transformative Learning taking place in the standard *WeValue InSitu* process. It reveals them as cycles of group-wise Meaning-Making and Meaning-Checking, with specific facilitation techniques used by the facilitator, which are also now explicitly identified. The group moves through iterations of increasingly precise self-realization through facilitated cycles of challenge, Meaning-Making and Meaning-Checking.

This new conceptualization will now allow formalization of the methodology, and transferable descriptions for training new facilitators and researchers instead of practice-based apprenticeships. This will in turn enable the portability and scaling-up of the *WeValue InSitu* approach for use in the production of transformational learning, which has been specifically identified by the IPCC and UN as a current need in the uptake of sustainability concerns by decision-makers – not only applicable to those in cleaner production but also in development planning for land use and new production landscapes, for management of business, and wider education. There is a limitation that only the *InSitu* version of *WeValue* was studied here, which requires that the participants have some kind of shared history of acting together. A further series of studies would be needed to see if similar findings emerge from differently constructed participant groups.

While working to conceptualize *WeValue*, this study has also revealed specific micro- 'elements' which contribute to transformational learning. There is no claim that they are transformative learning processes in themselves, because the pathways to learning were not studied here, and it is not known exactly where the learning occurs. It is simply known that TL is intrinsically occurring in the *WeValue InSitu* Crystallization Stage, and that it regularly occurs there ([Harder et al., 2021](#)). The other sub-processes in other *WeValue* Activity Stages may well be important for this: further work can relate all of these more directly and fully to themselves and also to established concepts in the field of TL. But a clear conclusion at this point is that the Cycles of Meaning-making/checking, and the Crystallization cycles/Steps presented here are clear elements contributing towards transformative self-realization of participants.

The findings of this study can open up a new research agenda for the wider fields of both transformative learning and ESD. A limitation is that the generalisability of the *WeValue InSitu* process has not yet been proven, only indicated (Harder et al., 2020), and it needs confirmation by actively checking in multiple future contexts and applications. If confirmed, then it can be used as a reliable tool to produce and study effects of different contexts, learning environments, types of participants, and facilitator idiosyncrasies. Studies could also be designed to know whether the *WeValue InSitu* materials and facilitator actions are themselves critical or not to the outcomes: whether they can produce different types of TL, and the relation to and between existing classifications of TL; whether tacit knowledge is an integral element or not; whether clear causal links can be traced from facilitator actions to the final TL outcomes, and how they vary. And whether the *WeValue InSitu* process can allow links to be made systematically between different theoretical or philosophical approaches, such as those of Mezirow, Nonaka, Schön, Senge, Sterling, Wals.

CRediT authorship contribution statement

Benita C. Odii: Original co-conception, links to literatures, Methodology, Data curation, data analysis, data interpretation, Writing – original draft. **Yanyan Huang:** maturation and development of ideas overall, links to Nonaka. **Nicole des Bouvrie:** detailed insights on the relevance and validity issues of different philosophical paradigms, assistance with the development of the links to Polanyi, Nonaka, Mezirow. **Marie K. Harder:** Original co-conception, methodological innovations, Supervision of each step, some links to literatures, writing (substantive reviews).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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