CHAPTER 10

Review of a Course-supported Design Research Intervention Process for the Inclusion of Education for Sustainable Development in School Subject Disciplines

Rob O'Donoghue, Shanu Misser and Janet Snow-Macleod

Introduction and approach: A co-engaged design research process of professional development

The study was informed by an expansion of the 'design research' reported by McKenny and Reeves (2012) and it developed as a collaborative design process similar to that described by Voogt, Laferriere, Breuleux, Itow, Hickey and McKenny (2015). Voogt et al. approached design research as a successive and developing process of formative work by participants working together to design and assess a learning programme. In our case the design work was undertaken within a course-supported process of ESD design innovation among participating teachers and subject advisors.

The collaborative Fundisa for Change professional development system had two intermeshed design dimensions: first, the design of the mediating Hand-Print CARE tools (a set of learning materials focusing on sustainability actions and ethics) for the course-supported Fundisa for Change process of professional development (see Schudel, Lotz-Sisitka, Songqwaru and Tshiningayamwe, Chapter 1); and alongside this, the co-engaged design research support materials for interventions undertaken by participants working in their subject disciplines. This chapter developed as a preliminary review of two course-supported design research intervention programmes

on the inclusion of Indigenous Knowledge Heritage and ESD pedagogy in school subject disciplines. Subject advisors and teachers participating in a course-mediated professional development process were invited to design school-subject-based ESD programmes for knowledge acquisition and participatory learning in CAPS curriculum work with the Sustainable Development Goals (SDGs).

Propositions (evidence/data) informing this chapter were derived from Hand-Print CARE project records and significant moments of insight in participatory design and intervention processes during the two Fundisa for Change short courses on deliberative professional development. The iterative insights and models of process reported here developed around cumulative case evidence and innovative moments that emerged through an open-ended retroductive¹ process where abductive inferences (Danermark et al. 2002) informed the refinement of schematic models of process as mediating tools to inform the inclusion of ESD.

The chapter presents these formative models in schematic diagrams alongside illustrative case evidence that informed the design of Hand-Print CARE materials as start-up exemplars for use with mediating ESD design tools in school curriculum settings.

The two Fundisa for Change programmes from which insights were drawn developed around Indigenous Knowledge as intergenerational heritage for situating curriculum topics related to sustainability matters of concern in the southern African region. The work of the Science Subject Advisors in Gauteng became centred on climate change, and the Intermediate teachers in the KZN Midlands explored a variety of Life Skills topics related to biodiversity, waste and nutrition. An outcome of the Natural Sciences course-supported work was a Hand-Print CARE module on African Heritage and Climate Change, and the Intermediate Phase deliberative work touched on waste practices, nutrition and how to look after local animals and habitats in times of change.

An overview of Fundisa for Change as a co-engaged Education for Sustainable Development design process

The study informing this chapter might best be characterised as an iterative process of design research and deliberative course-based intervention that emerged from:

- Collaborative research to design formative tools for participating educators to mediate the inclusion of ESD in school subject disciplines (O'Donoghue et al. 2020)
- A course-based process of co-engaged design and intervention research to explore, clarify and work with successively refined tools for mediating ESD in school curriculum settings.

¹ Retroductive inferences are insights derived through data that builds a picture over the passage of time and through reflection on past events.

The Fundisa for Change course invited participants to work together with formative tools for mediating new environmental **knowledge** in a school subject, while exploring interventions to improve their **teaching practices** and enhance the **assessment** of learning (Fundisa for Change 2013). A key attribute of Fundisa for Change as co-engaged design and intervention processes is a tacit recognition that educators working together can bring about transformation through ESD. This perspective carries through to participating teachers working in collaborative learning with their learners to produce knowledge-mediated change for human flourishing. In the Fundisa for Change courses, this is assumed to develop from a deepening grasp of the subject through the inclusion of new environmental knowledge, taking into account several sources of propositional and local knowledge, alongside enhanced ways of teaching with improved assessment of learning.

The co-engaged dimension of the Fundisa for Change collaborative process of professional development was consistent with a generative design research process of deliberative intervention as emergent and cumulative processes framing the course and this review. A design research process of mediated participant intervention was thus aligned with, and activated within, the Fundisa for Change professional development process.

The framing of the Fundisa for Change course progression for ESD

This chapter reports on emergent conceptual tools informing mediating models of process for the inclusion of ESD in school subject disciplines. The deliberative iterations of design-based intervention research as collaborative work with participating subject advisors and teachers enabled us to clarify and refine conceptual schema (tools). These were used for supporting teachers to undertake learning design work by planning ESD lesson sequences with their learners, using a course-mediated process (Figure 1) that involved the following:

- Reviewing the subject curriculum in context with associated ESD competencies.
- Working with the SDGs to co-define environment and sustainability concerns in relation to the subject and new environmental knowledge in the curriculum.
- Accessing learning materials and activities for inclusion in a subject-based ESD programme of teaching and learning.
- Planning learning progressions to mediate content acquisition and learner-led collaborative inquiry with collective/individual agency in problem-solving or action-taking.
- Developing an appropriate strategy for the continuous assessment of attainment, skills and competencies as well as fostering significant learning outcomes and change in material practices.

Figure 1. Course-supported design research tools and mediating schema for expanded lesson sequences and assessment planning

The mediating progression reflected in Figure 1 was developed by Lotz-Sisitka and Chikunda (2019) for a Unesco Sustainability Starts with Teachers (SST) programme that both drew on and informed the Hand-Print CARE collaboration. This course-based networked social learning progression framed the collaborative design-based action research processes of mediated participant-intervention undertaken with the subject advisors and teachers involved in the two Fundisa for Change programmes reviewed here.

The development and framing of Hand-Print CARE materials

Ten start-up Hand-Print CARE modules (available at <https://sustainabilityteachers.org/resources>) were made available to the participating teachers and subject advisors as exemplars around which to develop their own ideas based on key curriculum subject area topics with an environment and sustainability focus. All the learning support materials were available as open access digital files to be used as start-up materials for the inclusion of indigenous heritage and new environmental knowledge in Life Skills, Natural Sciences and other subject disciplines.

Open-ended and formative Hand-Print CARE tools for framing and mediating ESD learning progressions as locally relevant themes (LORET) (WWF 2012) (see Figure 2 below) were compiled using a four-quadrant planning template that included:

- start-up photographs and true stories,
- related inquiry and problem-solving tasks,
- clarifying change challenges,
- action-learning and assessment tasks.

Hand-Print CARE materials

Figure 2. Including locally relevant themes in Hand-Print CARE teaching materials
Source: Adapted from WWF (2013)

The Hand-Print CARE materials were used as exemplars for situating and expanding teaching and assessment practices in a supportive course-mediated programme to include ESD in school subject disciplines.

The inclusion of indigenous knowledge

The participating teachers deliberated examples of intergenerational indigenous knowledge associated with the subject content they were currently teaching.

Teachers in the KZN Midlands, for example, deliberated how teaching about waste and school clean-ups was a continuous labour of teaching that 'bore little fruit'. The schools appeared to be locked into cycles of litter clean-ups without a transfer of knowledge to effect change in 'the littering behaviour of learners'. This problem was approached as a design process of formative intervention to enhance relevance in ESD with, for example, the inclusion of the Zulu Indigenous Knowledge practices of *Izalene* – composting.

1. *Deliberations revealed how teachers and supporting NGOs had been working on waste over many years where it was included in the curriculum and as part of an Eco-School process of whole school development, with some of the schools having been awarded 'Green Flags' for their innovative efforts. Despite this, the teachers were not happy with the ESD outcomes as the challenges of littering in the school environs persisted.*
2. *Work with the SDG Wheel revealed that waste and associated pollution and disease was a threat to community pride and health and that this was included as a Life Skills topic that many of the teachers regularly taught.*
3. *Working with the Past-Present-Future model of process after Chikamori, Tanimura and Ueno (2019) and using an IK-Today video on 'Dumping Rubbish', we looked into how the children are being taught out of their experience of the presence of waste as a punishable problem with an incomplete understanding (absence) of how past change has produced the littering challenges of the present day. The IK video opened up understanding of the waste problem of the present through a window on how things had changed out of the past.*
4. *To explore how to expand learning progressions we posed the question, 'Why was litter less of a problem for the Nguni in the past?' and began to design changed teaching progressions around start-up stories and pictures of 'Izala/Izaleni'.*

Note: The numbering of the above section corresponds with course activity progression in the above diagram. We did not initially take the process into the development of continuous assessment strategies as the litter question emerged early in the course. The deliberations prompted some teachers to work on improving their teaching of litter and waste through the addition of Nguni heritage so as to better understand the present problems of waste. Their teach-backs as the course progressed drew on the mediating tools for lesson planning but some found it difficult to expand their normal categories of lesson planning, using a four-quadrant approach. All of the work did, however, strongly affirm the relevance of heritage knowledge as a past for understanding the present conditions and for contemplating creative innovation for future sustainability.

The Gauteng subject advisor deliberations were centred on the inclusion of climate change in Science teaching. In a similar course-supported collaborative design research and intervention process, they also worked from the subject curriculum and developed course deliberations around the inclusion of heritage to enhance relevance and balance the interplay between intergenerational epistemic processes and the scientific knowledge on climate change in the curriculum.

1. *Working with curriculum documents, participants identified how the inclusion of climate change as new environmental knowledge was orientated towards learning the facts of the matter and doing something with the knowledge and insights acquired. The analysis revealed how the topic presented as abstract concepts and systemic knowledge to be acquired so that students could contemplate the changes in human material practices necessary to maintain future planetary conditions for all living things to thrive. Participants deliberated how the topic presented as abstract knowledge necessary to be acquired for students to make sense of climate change and make the necessary changes to avoid a fearful future. To moderate this reading of the topic as reified abstraction of a crisis produced by humanity, we resolved to work from indigenous knowledge and with a practical example of climate change in southern Africa.*
2. *The SDG wheel deepened our grasp of the impact and scope of climate change as a key matter of concern for teachers and learners to explore across the acquiring of a conceptual grasp and the reading of its implications in contexts of risk. Climate variation in the Eastern Cape was explored as an example and we resolved to work towards the development of a Hand-Print CARE exemplar on Climate Change.*
3. *With no start-up resources to work with, we started with the indigenous knowledge heritage of the amaXhosa of the Eastern Cape, where climate variation in cycles of drought shaped seasonal variation migrations to the further southern grasslands of what came to be known as The Zuurveld. Within the course we began to write up case evidence from the recent drought in Makhanda. This framed climate change extremes as complex systemic crisis events that encapsulate many interacting dimensions of the SDGs.*
4. *The Xhosa heritage practices of a season-end process of Gelesha ('cleaning fields and breaking the sod') and drought season climate migration provided a rich cultural tapestry for a start-up story for climate inquiry. It resonates with the explanatory scientific knowledge we now have about the impact of the elNino-laNina oscillations in the southern Pacific on climatic variation in southern Africa and elsewhere. The seasonal practices in times of severe drought also point to how increasing atmospheric carbon is producing regional warming that is having forcing effects on seasonal cycles in southern Africa. This deliberative work served to mute the reified abstractions presented in the subject content, closing the current chasm between concepts and actions to mitigate climate change at a global level. Both of these deliberative trajectories (past heritage practices and case-based explanatory insights) pointed to a need for abstract subject concepts to be used in an ESD process of illuminating the present through an understanding of the past, as proposed in the Transformative Model of ESD uncovered by Chikamori et al. (2019).*

5. *The participants had depth knowledge on the assessment conventions for continuous assessment both of and for learning, as well as the requirements for testing knowledge, understanding and higher order skills of synthesis, analysis and innovation. We thus spent more time on the question of significant learning. This produced a rich discussion on how the inclusion of heritage had enriched our own learning and how case-study work was essential for relevance.*

Note: The 5-day format of the Gauteng course did not allow the time for the co-development of a Hand-Print CARE module on Climate as a work-together/work-away process. The materials development work was thus done after the conclusion of the course and will be fed back to participants as an exemplar to be modified for their use in teacher training. A workshop kit has also been developed.

The above vignettes from each course process highlight the situating and additive role of heritage in ESD. They also illuminate ESD as individual and collective processes of becoming engaged in the matters of concern in the present that have been produced by material practices of the past. In uncovering these insights for effective subject teaching as ESD, each of the mediating tools developed in the Hand-Print CARE collaboration were explored, reviewed and refined as the participatory course unfolded. Key contours of the implicit design research process in the course are explored in the review of the course process and mediating tools that follow.

ESE/ESD methodological texts as a starting point

Participants worked with a Fundisa for Change methodology text (Rosenberg et al. 2013) that exemplified diverse methods commonly used in Environment and Sustainability Education (ESE), for example, ‘problem-solving’, ‘role-play’, ‘projects and practical actions’ and ‘demonstrations and experiments’. The course narrative here was one of introducing ESE methods to be explored and applied to improve teaching practices.

A course task to explore a few of the discrete ESE methods provoked discussion, with some innovative suggestions. We then worked on the curriculum imperative for active learning as a way of characterising the learning transactions across the diverse methods explored by participants. Work with the 5Ts of Action Learning (Figure 3, O’Donoghue et al. 2018) opened up the range of learning interactions in differing subjects. We also explored how children today are more visual, using media and the internet as well as being exposed to more graphic animations.

The Fundisa for Change methods text on methodology was thus used as an introduction to discuss the methodological scope of current subject teaching practice and how this could be expanded beyond existing Teach-Task-Assess approaches for including ESD in subject disciplines.

Planning

5 T's of Action Learning

Figure 3. Relating the 5 T's of action-learning with the 4-quadrant schema for expanded task sequences

Source: Adapted from 'How are ESD learning and training changing environments', Unesco (2018)

Teach-Task-Assess conventions as foundations for expansive learning pathways

The course structures were situated within a prevailing pedagogical conventional wisdom that classroom education involves *teaching subject knowledge through learning tasks, the outcomes of which are assessed*. Here assessment commonly serves to determine if the learning of knowledge, values, attitudes and skills has produced desired competencies that reflect in the learner having acquired and developed valued knowings, beings and doings for success in schooling and daily living.

The formative rationale for a Fundisa for Change collaborative course of mediated participant intervention resonated with a Teach-Task-Assess start-up (Figure 4).

In opening with this mediating schema, we noted three processes supporting collective learning on the course:

1. Teachers were surprised that ESD was not presented as something new and extra to be infused into teaching practices but rather as situated in everyday teaching, common sense and local concerns.
2. There was a good correspondence between Hand-Print CARE and the Fundisa for Change inclusive approach.

3. The blank quadrant created a sense of there being something to add, as well as of this being possible without a rejection of what is currently seen as good teaching for the acquisition of subject knowledge and competencies.

In the opening interactions, participants explored the inclusion of knowledge acquisition for learner participation in knowledge construction and the development of personal and collective agency in change challenges.

Expanding 'Teach-Task-Assess' conventions

Conventional subject teaching is centred on concepts and competencies through 'Teach -Task-Assess' progressions

We can deepen and extend these through:

- Deliberative teaching to situate and clarify concepts (Q1).
- Developing inquiry tasks to refine systems thinking (Q2).
- Assessment to extend, apply and test competences acquired (Q4).

Figure 4. An initial mapping of Teach-Task-Assess conventions underpinning subject-discipline teaching

Figure 4 reflects the starting point for identifying the expansion needed for a balanced interplay of **knowledge acquisition** and how this opens up opportunities for deliberative processes of **participatory meaning-making and action** in learning transactions that are more learner-led and centred on local matters of concern.

This opening insight and start-up perspective on methodology shaped a collaborative learning and co-engaged research landscape for working together on ESD as an expansion of a sound conventional wisdom with a simple four-quadrant schema for lesson planning for **knowledge acquisition** and **participatory learning** in subject disciplines, as given in Figure 5.

Clarifying ESD as a process of methodological expansion

ESD as localising action-learning expansion of Teach-Task-Test conventions

Sfard (1998) suggests school learning includes both: **ACQUISITION** and **PARTICIPATION** from acquiring subject knowledge (Q1) for inquiry to find out about matters of concern (Q2), and then work out possible solutions (Q3) so as to act & assess better ways of doing things together (Q4).

Figure 5. ESD as a methodological expansion

Source: Adapted from Edwards (2014)

Start-up Hand-Print CARE materials had been constituted to open up mediated and learner-led learning progressions informed by the Vygotskian task sequencing schema developed for teacher education by Anne Edwards (2014). The Edwards paper was introduced as a professional reading on the course and the four-quadrant model was applied in conjunction with the Sustainable Development Goals (Figure 6).

The implicit assumption underlying this notion of mediated knowledge acquisition and participatory meaning-making transactions associated with this, is that all learning is a process of expansion and that this develops from and in relation to what is known (knowledge heritage) and what is already being done (life experience).

This premise shaped the introduction of a Hand-Print CARE approach to ESD as deliberative expansions of conventional **Teach-Task-Assess** progressions commonly found in most school subject disciplines. We worked with this underlying conventional wisdom to deliberate how Edwards (2014) reports that this teaching progression found in conventional lesson planning can foster rote learning of facts in ways that mute agency in relation to the application of concepts (recontextualisation) and an associated higher order mastery. Participating teachers identified with the Teach-Task-Assess subject-teaching progression and used it as a referential benchmark around which they might improve their teaching and assessment practices through the Fundisa for Change participatory course.

In this way, each of the two Fundisa for Change programmes (Subject Advisors and Subject Teachers) were introduced to ESD with a focus on materials exemplifying intergenerational practices as indigenous heritage. Both were conducted with primary teachers.

Ethical purpose in subject teaching using the SDGs

Figure 6. SDGs as a basis for mediating learner competence to 'recognise and assess' sustainable development concerns

Source: Adapted from creative commons ELRC Rhodes University, South Africa

Through engaging with and deliberating local matters of concern activated in case story materials, the issues presented as locally authentic, taking the learners into inquiry tasks where they gathered evidence in the home and community contexts of daily life.

With the teachers, we deliberated problem solving as a methodology and worked with the SDGs to locate environment and sustainability problems as open-ended challenges in complex systems. We explored how the Fundisa for Change methods booklet presented ESD problem-solving as an open-ended process of 'action research and community problem solving' (Rosenberg et al. 2008: 28). Mini-SASS was used as an example and we deliberated how learners need to base their problem-solving inquiry work on true stories that can serve to mediate how to undertake a problem-solving inquiry. This resonated with the heritage work of Chikamori et al. (2019) where 'the past is a necessary mirror for understanding the present'.

We concluded that students cannot simply be presented with problems to solve but that we have to learn to work with 'start-up case materials' to frame problem-solving

inquiry, and that this work can be deepened and activated using the ‘SDG Wheel’ (Figure 6). This deliberative work opened up climate change and the sciences as a focus for the Gauteng subject advisors. The KZN Midlands participants developed a wide range of focus areas based on their analysis of the curriculum.

Working with Edwards’ (2014) expansion of conventional Teach-Task-Assess curriculum processes, the knowledge was modelled in an authentic story (Q1), shaping leading questions for an inquiry task (Q2). Here the inquiry and case narrative often shaped emerging empathy and concern, along with a need to resolve contradictions through a remodelling of better options (Q2–3) and a re-imagining of possibilities that could, in turn, be taken up into change challenges that were either enacted or narrated by the students (Q3–4). Start-up topic materials were provided for teachers to adapt for engaging their students in learning tasks to develop competences.

The inclusion of ESD competences and systems thinking

The introduction of ESD competencies was not an easy matter as these present as abstract propositions to be inscribed and developed in learning transactions. We thus used the four-quadrant model to deliberate how and where to include activities and tasks to develop and refine the competencies necessary for transitioning to future sustainability. This developed as a translation task that simplified and located the use of the Unesco ESD curriculum competencies within a teaching and learning progression, from subject knowledge acquisition to more learner-led activities to foster participative initiative and agency (see Figure 7).

ESD competences and subject disciplines

Meaningful learning expands around intergenerational knowledge and life experience where we learn:

- To know things in relation to context, subject and concerns (Q1).
- How participants develop ESD competences with subject concepts and systems thinking (Q2 & Q3).
- How valued knowings, beings and doings can be resolved, applied and assessed (Q4).

Figure 7. A schema for relating competencies to learning progressions and tasks

Source: Adapted from Unesco (2017: p. 10)

In the opening Hand-Print CARE materials an animated model of a simplified ecosystem was used as a starting point for the introduction of systems thinking at the level of knowledge acquisition for scientific subjects. The knowledge-led models of process worked with became grouped as competencies related to ‘critical systems modelling’ within which one might constitute the more agentic competences shaping reflexive modes of action. In this way, participants were able to begin to work with ESD competencies in lesson-planning sequences that transitioned from subject knowledge of social-ecological, economic and political systems to the generative competencies (reflexive modes of action) shaping the agency necessary to bring about individual and collaborative change.

A blended approach to ESD and continuous assessment for and of learning

As each course progressed it became apparent to us that the emerging schema for scaffolding ESD processes of Hand-Print CARE in subject disciplines needed to correspond with the prevailing curriculum specifications for the assessment of learning. We thus used a similar strategy of expansive innovation to that reflected in Figure 8, where the four-quadrant learning progressions schema is juxtaposed with the prevailing continuous assessment schema of the curriculum.

Subject Teaching and Assessment

Figure 8. A template for contemplating continuous and summative assessment in CAPS subject disciplines

Using this approach, we aligned school subject ESD progressions with an existing model of continuous assessment using an updated but simplified model for conventional classroom assessment predicated on Bloom's Taxonomy.

In our deliberative work we noted that ESD is an evaluative process in itself, thus it requires an integrated process of continuous **assessment for and of learning**.² This meant there needed to be a balance between the students developing the competencies to assess matters of concern, if they were to develop the competence necessary for bringing about much-needed change in human material practices. Working from school exam performance records, we noted that most South African learners are not doing well at answering higher order examination questions. We thus approached ESD as a means of enhancing higher order competencies and related this to movement through quadrants of knowledge acquisition (Learning and Finding Out), into working things out with new understanding and going as far as to try out new ideas and assessing these. Within this blended process of continuous assessment for and of learning as a referent, we drew on the work of Shumba, Mandikonza and Lotz-Sisitka (Chapter 12), postulating that we would all want ESD to produce significant, higher order learning and the agency to bring about both personal and collaborative change.

An important expansion in conventional assessment was thus two-fold:

1. The inclusion of evaluative assessment of matters of concern as a competence for ESD.
2. The addition of a schema for assessing 'significant learning' after Shumba, Mandikonza and Lotz-Sisitka (Chapter 12).

The latter addition was included as an exploratory model of process for teachers to try out and assess in their subject-based ESD programmes.

Conclusion: Tentative insights on the inclusion of heritage and ESD competencies in school subjects

The course-supported design work with the Hand-Print CARE mediating tools accentuated the following outcomes:

- The inclusion of history and cultural heritage in locally relevant themes for co-engaged learning transactions.
- The importance of the acquisition of new environmental knowledge towards competence development for recognising concerns, assessing value, and initiating knowledge-informed actions for change.
- The way in which deliberative work with the SDGs served to broaden and deepen participant grasp of ESD concerns of local relevance.

² This is a subtle expansion of existing conventions for the continuous assessment of learning in South African schools.

- How work to refine diverse forms of systems thinking interacted to produce higher order thinking and action ideas in course deliberations.
- Start-up true stories engaged learners in story-sharing that provided a gateway to locally relevant teaching.
- Deliberative learning transactions led to the identification of absences in past practices which emerged as contradictions in the present that needed to be resolved through ethics-led change.

Many of these insights were synthesised into an open process model for ESD in school subject teaching settings (Figure 8). This is reflected as a mapping of the key dimensions in a learning pathway for the inclusion of ESD in the teaching of new environmental knowledge with an integrating inclusion of other knowledge systems.

An integrated approach starts with the latter (plural epistemologies) by highlighting history and plural cultural perspectives and experiences as necessary foundations for learning-led change, as participants bring their knowledge into meaning-making deliberations.

Drawing on the simplified ‘prediction loop’ model differentiated in recent work in the cognitive sciences (Barrett 2017), it is possible to model how learning about abstract and complex concerns like climate change can develop in cyclical deliberative work with new knowledge that enables participants to predictively simulate propositions that are compared and resolved through both individual thought and collective deliberations that shape and inform this.

Here, the inclusion of the SDG wheel as a mediating tool was effective for opening the scope and depth of knowledge related to ESD matters of concern, such as climate change and biodiversity loss.

We also found that work with critical systems modelling and competencies emerged in collective modes of action as participants learned together to recognise concerns, assess value and act for future sustainability (Schreiber & Siegfried 2017). Learning in a deliberative environment and sustainability education is clearly an iterative and collaborative process of expansive learning and transformative action with enhanced capability to know, feel and do things differently, and these processes inform changed dispositions and material practices.

Finally, taking the integrated elements explored in this chapter into a model of process for ESD as an open learning pathway, a key conceptual underpinning of an emerging picture of ESD in school subject disciplines is a critical realist grasp of how the concerns of the present derive from a retroductive grasp of how the past has produced sustainability issues in the present, after Chikamori et al. (2019). The Transformative Model of ESD that these authors propose notes how generative processes of meaning-making can activate retroductive learning to open up future possibilities that can be clarified and worked towards within generative re-imaginings and ‘back-casting’ deliberations.

Overall, the Hand-Print CARE collaboration and the two Fundisa for Change courses accentuated a need for course-supported processes of co-engaged design work

to clarify and initiate ESD in school subject disciplines. The design research served to refine the mediating tools, and the emerging exemplars provided starting points for ESD as a process of curriculum innovation in diverse subject disciplines.

The inclusion of cultural heritage and ESD competences in school subject teaching

Figure 9. An open process model for a learning pathway integrating plural heritage knowledge, the SDGs and ESD competencies in locally relevant themes for teaching school subject disciplines

Source: Adapted from ESD Expert-Net (2018)

Acknowledgement

The collaborative design work as a co-engaged process of course-supported action research would not have generated the insights reported here without the open and honest reflections and on-course reporting of all the participants. Acknowledging thanks must thus go out to all involved in this exploratory work in which it is not possible to ascribe particular insights to individuals. We have tried to be true to an understanding that the inclusion of ESD is a collaborative endeavour with common mediating tools but wide contextual variation.

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