Training Sustainability Change Agents: Lessons from International Water Education

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Abstract

Unsustainable socio-economic practices manifest prominently in water crises and water-related disasters. This turns water managers into prototypical sustainability professionals, and important change agents in a broader societal transformation towards sustainability. Water education is, de facto, sustainability education. By bridging the gap between a pedagogical and a professional view on required sustainability competencies, experiences with water education offer valuable insights in the context of Education for Sustainable Development (ESD). The paper reports on recent experiences with increasing the sustainability

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orientation of water education programmes, and explores key issues that require attention in ESD programmes in general. The experience of three international degree and capacity development programmes at the UNESCO-IHE Institute for Water Education and the National Autonomous University of Mexico (UNAM) reveals lessons on learning environments and capacities essential to the design and implementation of training programmes in, for and about sustainable development. To guide ESD programme development in higher education, it proposes adopting a 'learning and applying what we teach' approach, with particular attention to: skill development for meaningful stakeholder engagement; normative and value-based aspects of sustainability education; and necessary organizational capacities and professional skills of educational providers.

Keywords
ESD · Sustainability · Competencies · Higher education

1 Water Education as Sustainability Education

The 1992 Rio conference on Environment and Development made the case for sustainability education, to empower *"people of all ages to assume responsibility for creating a sustainable future"* (UNESCO 2002). Further encouraged by the UN Decade of Education for Sustainable Development 2005–14, and target 4.7 of the Sustainable Development Goals (SDGs) (United Nations 2015), universities around the world started programmes providing knowledge and skills needed for sustainable development. Nevertheless, Education for Sustainable Development (ESD) is far from accepted as mainstream. Even within the ESD community, common principles for curriculum design and didactics are still debated (Figueiró and Raufflet 2015; Lozano et al. 2013).

Water education is inherently connected with ESD. The principles of Integrated Water Resource Management (IWRM) are, de facto, sustainability principles. Moreover, climate change and commonplace unsustainable practices increasingly manifest in water-related disasters, making water management failures highly visible and politically relevant. This mandate gives water education a distinct perspective in the context of ESD. For future water professionals, sustainability education is a matter of professional skill development. Re-focusing the education of water managers to prepare for complex real-life water problems requires increasing attention to interdisciplinary research, consideration of political and ethical dimensions, as well as social and reflexive competencies that make knowledge actionable (Irvine et al. 2016). Recent efforts to incorporate the necessary level of sustainability orientation into water education programmes yielded valuable insights regarding learning environments and capacities needed to develop

the complex competency sets required. The purpose of this paper is to share key lessons learned in water education, and explore critical issue areas that require attention in ESD programme design in general.

The following sections present experiences collected in three different types of water-related higher education programmes: an interdisciplinary graduate programme; a set of joint master programmes offered by collaborating universities; and a range of capacity development programmes for working professionals at the UNESCO-IHE Institute for Water Education in the Netherlands and the National Autonomous University of Mexico (UNAM). After short summaries of the research approach and case studies in Sect. 2 and 3, Sect. 4 discusses critical issues encountered across the programmes and reflects emerging lessons for ESD research. Section 5 proposes resulting implications for ESD programme development in higher education.

2 Research Methodology

In the tradition of Grounded Theory, the analysis is based on empirical observation, review and evaluation of existing water education programmes and their development process. The ESD analyses presented in the case studies were triggered by routine reviews related to institutional strategy, curriculum development or didactics, which revealed a need for more substantive analysis of sustainability-oriented programme activities in the respective institutions. Despite the differences in programme format, the experience of the programme coordinators shared sufficient similarities to stimulate a structured search for common critical issues and common principles suitable to inform broader ESD research. Independent but coinciding formal evaluations of the three programmes provided the data and opportunity for this study, as elaborated below.

In the case of UNAM, the introduction of an interdisciplinary graduate programme in sustainability science represented a new programmatic approach for the university. A theory-based collaborative programme design process was developed, with in-built continuous evaluation of the process itself, and a systematic summary evaluation of its impacts. Methodically, the process had the characteristics of a design-experiment. The curriculum development approach built on theory of collaborative processes (Margerum 2002), embedding elements reflective of sustainability science, including collaborative design, active participation, social learning, shared visioning, and backwards design of program learning outcomes by strategic partners from academia and the public sector. The case study draws on an evaluation performed by an independent specialist over a two-year period, which examined project activities and implementation through a series of surveys, key informant interviews, direct observations, and review of secondary project sources (Charli-Joseph et al. 2016).

Review of the UNESCO-IHE joint degree programmes was initiated by an informal reflection on alignment of programmatic activities with didactic principles and external accreditation criteria. The responses led to a comprehensive structural review of content and didactics of the Environmental Science programme, and triggered collaborative revision of the programme in a series of workshops and working groups. The process resulted in the overhaul of several modules, and the establishment of academic principles to guide further programme reform. Building on the lessons learned, a formal evaluation of the joint programme in Limnology and Wetland Management was conducted in 2014 by an independent external reviewer familiar with the subject, and the ecology and institutional structures of sub-Sahara Africa. The evaluation considered content, grading and administrative arrangements based on interviews with staff and students at the three institutes involved, a review of documentation and course materials, and observation of oral thesis defences at UNESCO-IHE. The case study draws on the results of the reviews and programme development workshops, as well as on formal module evaluations by the students and 'reflection reports' prepared by module coordinators since 2013.

During 2014–2015, UNESCO-IHE undertook an assessment of its capacity development (CD) programme as part of the review of its strategic direction. The review was conducted by a multidisciplinary task force spanning social science to engineering; through a series of internal workshops with CD project leaders and experts; an international stakeholder event; and an international survey among its stakeholders (Wehn et al. 2015). At the time of the review, some 200 CD projects were ongoing and more than 750 had been completed over the previous 25 years. The international stakeholder survey (with 117 valid responses) contained questions on the role of the institute in CD, on alliances with southern partners to strengthen the relevance of outputs, and on actions to increase the impact of CD projects. The international stakeholder event gathered about 80 participants from various backgrounds and organisations, many of whom had participated in the institute's projects. Specifically, this included partners from southern and transition countries, Dutch and international partners from education and knowledge education institutes, water sector organisations including government, donors, the private sector and NGOs. The survey results, workshop and event reports inform the third case study on UNESCO-IHE's capacity development activities.

The three ESD initiatives reported in this paper are works in progress; curricula and didactics continue to evolve in response to results of continuous evaluation and reflection. The issues and lessons presented in this paper are, therefore, neither complete nor conclusive. Furthermore, the context-specific participatory approaches to programme design and the independent design of programme evaluations limit comparative analysis of the three cases. Both aspects restrict the ability to draw generalized conclusions. At the same time, the independent empirical observation of the three critical issue areas explored in this study recommends them as conceptual categories for ESD research, open to further investigation.

3 ESD: Three Experiences

3.1 UNAM Sustainability Science Programme

Mexico lacks trained professionals with the knowledge and skills required for sustainable development, reflecting an absence of higher education programmes focused on complex socio-ecological issues across Latin America. In response to the demand for more sustainability-based curricula, courses were added ad hoc to a number of disciplinary programmes at UNAM over the years, but there was no successful degree-programme focused solely on sustainability. A sustainability science programme, by definition, integrates multiple disciplines and complex issues (Kates et al. 2001), but neither aspect was explicitly addressed until the university established an interdisciplinary Sustainability Science MSc and PhD graduate programme in 2015, after five years of intensive programme development.

The experience offers valuable lessons for institutes that share similar challenges. Curriculum development for the interdisciplinary degree encountered some barriers found in universities all over the world, such as an emphasis on maintaining disciplinary boundaries and a focus on academic careers over those outside academia (Miller et al. 2011). Other obstacles were more context-specific, including integration of local development priorities and the absence of regional approaches to sustainability science. With regards to the former, the process benefited from guidance and collaboration by the School of Sustainability of Arizona State University, a pioneer of sustainability science in the USA. With regards to the latter, UNAM will explore adaptation of sustainability science approaches originating from the global north, and adjust concepts to emerging economies and developing countries. In this regard, the Sustainability Science graduate programme serves as a pilot and model for other institutions in the region.

A collaborative approach was the key element of programme development, beginning with 18 months of intensive collaborative workshops (Margerum 2002). The intentionally slow and deliberate process proved successful in distilling agreed curricula from the visions of 18 academic entities, ten disciplines across the university, and important public sector agencies such as the Secretary of Environment and Natural Resources (Charli-Joseph et al. 2016). It necessitated flexibility, but ensured that sufficient attention was paid to differing needs of academically oriented PhDs and competency-based MSc degrees. Involving the public sector ensured that the programme specifically addressed local priorities, including poverty reduction, inequality, and vulnerability to global change, as well as themes such as water systems management. However, the competency-based structure of the MSc programme presented a major challenge in the development of the PhD curriculum. Competencies tailored to serve local professional demands proved restrictive for a PhD and research track, which requires stronger theoretical grounding, academic rigour, and advanced research skills, as well as inclusion of cross-cutting themes such as complex socio-ecological systems and collaborative planning.

The participatory process and collaborative visioning in workshops reflect the principles of sustainability science itself. Applying ambitions of the field to the programme development process revealed core lessons, as well as remaining barriers. Buy-in from a variety of disciplines was the most important benefit, with all participants developing a sense of ownership over the programme. Previous attempts to create interdisciplinary programmes at UNAM failed to attract commitment across disciplines, but the Sustainability Science programme reached critical mass and broad support from actors across the university. The interaction with the public sector created strong awareness for the sustainable development needs of Mexico. Involving relevant agencies ensured that skills gained in the UNAM Sustainability Science graduate programme reflect national priorities, and values necessary for achieving the SDGs, while maintaining academic standards. Close monitoring and continued communication among academic disciplines will be needed, however, to sustain institutional support, maintain disciplinary cohesion and promote evolution of the programme.

3.2 UNESCO-IHE International Joint Masters Programmes

UNESCO-IHE's mission is the education, training and capacity development of professionals and sector organisations for sustainable water use; its MSc and PhD programmes target students from developing countries and emerging economies (UNESCO-IHE 2015). Increasing international collaboration, reflected in double or joint degree programmes with several partner institutes, puts UNESCO-IHE at the front of a broader trend. A recent survey of 245 higher education institutions in 28 countries reported that almost all had plans to develop more joint programmes (Chevallier 2013). Three of UNESCO-IHE's programmes particularly embody the principles of sustainability education. The joint masters in Limnology and Wetland Management (LWM) offered with partners in Kenya and Austria, as well as joint specializations in the International Master of Science in Environmental Technology and Engineering (IMETE), and the Environmental Technology for Sustainable Development (ETSuD) masters, train working professionals in sustainable water resource management, addressing a range of technical, procedural and relational aspects of complex environmental management challenges.

Core challenge in the design and implementation of joint programmes is coherence in content, quality and examinations. In contrast to double degree programmes, in which partners award separate degrees in line with their own examination regulations, joint degrees award a single diploma based on examination regulations agreed by all partners. Standards set by intergovernmental or national accreditation authorities are an important tool for quality assurance in such programmes. For example, the European Bologna process promotes comparable and compatible education systems by describing qualifications in terms of workload, learning outcomes, and competencies (Froment et al. 2006). To support international collaboration, UNESCO-IHE MSc programmes are both nationally accredited and designed to meet Bologna Level 7 criteria.

Sustainability education has to confront students with the uncertainties and diversity of perspectives associated with complex problems (Lansu et al. 2013). To this end, UNESCO-IHE's didactic design is rooted in the educational theory of Blooms Taxonomy,[1] using a mix of knowledge, theory and methods training to develop analytical and academic skills. The results of an internal review in 2012 suggested a need for improvements in developing critical thinking, communication skills, and quantitative analysis; a subsequent programme revision aligned knowledge content with these dimensions. As the review covered students enrolled in both single and joint degree programmes, it uncovered challenging questions about the progression of skill development in the joint programmes. Specifically, LWM students complete training in Austria and Kenya before joining UNESCO-IHE, and the resulting skill profile has to be accommodated within the didactic frame of the overall Environmental Sciences programme.

In 2014, the partner institutions involved in the joint degree initiated an independent review of the LWM programme, examining syllabus and learning objectives, assignments, examination and administrative arrangements. The review attested a generally good fit between the course objectives and design, as well as high relevance of the programme especially in the developing world. But it noted the high amount of teaching materials and observed that "*knowing details is sometimes encouraged at the expense of critical thinking*". Striking the right balance between content and critical thinking is a general challenge of academic programming, but requires particular vigilance in joint programmes and sustainability education. Overlaps and inconsistencies between partner institutions can aggravate content overload of students who already have to adjust to several learning environments. Skills and competencies central to ESD (Wiek et al. 2011) require systematic development and, therefore, close collaboration among partners. Not last, moving between different environments in itself develops skills for multi-stakeholder environments typical for sustainability professions, but this opportunity is explored best if complemented with effective reflection.

The review highlighted that the organisational and logistical demands of joint programmes, the need for highly efficient administrative structures and sufficient human and financial resources, are frequently overlooked. Success depends on clearly defined operational agreements and exam regulations that should be developed and governed by joint management committees. Considerable effort was required to align marking ranges and credits for the LWM programme, even between European partners. Negotiating agreements with non-EU partners added further challenges in understanding and matching standards. Implementation of joint and double degrees need on-going attention to programme quality (Froment et al. 2006). The enthusiasm of a few dedicated individuals, a frequent starting point for joint programmes, is not a basis for long-term success. In a telling remark the LWM reviewer noted that the smooth functioning of the programme "*says a great deal for the determination of both academic and administrative staff*".

[1] http://www.nwlink.com/~donclark/hrd/bloom.html.

3.3 UNESCO-IHE Capacity Development Activities

UNESCO-IHE's track record in capacity development within the water sector spans six decades, and amounts to over 40 % of its recent annual revenue (UNESCO-IHE 2015). Capacity development programmes and projects focus on individual, organisational and institutional capacity in IWRM and sustainability. Project modalities typically comprise combinations of education and training, joined research, advisory services, e-learning, knowledge networks and partnerships (Wehn et al. 2015). Experiences across a range of projects reveal a number of common challenges and key issues.

Contemporary capacity development emphasizes locally-driven approaches (OECD 2011), reflected in project designed around training-of-trainers and local change agents. The approach requires local beneficiaries eager to learn and stimulate change. Motivation cannot be taken for granted in any learning environment, but in capacity development there are a number of specific challenges. Training-of-trainer courses for water supply experts or tailor-made trainings for ministry staff frequently suffer from poor attendance and participant selection based on favouritism or availability rather than suitability. Even the best designed training will fail to stimulate change if participants refuse to engage in 'active' learning or to take responsibility for implementing changes afterwards.

Sustainable water management and IWRM build on multi-stakeholder processes, requiring multi-disciplinary and transdisciplinary skills, creative problem solving and critical thinking, as well as interpersonal skills that foster collaborative learning (Sahlberg and Oldroyd 2010; Weatherly et al. 2003). Such skills are inherently difficult to 'teach'; cultural and ethical aspects of international collaboration increase the challenge. Local norms might discourage critical thinking, both in training and workplace environments. Norms and custom might demand behaviour diametrically opposed to the ideas of sustainability education, prescribing a passive role for participants, imposing restrictions based on gender or other characteristics, stipulating that 'the trainer knows best', and discouraging or even prohibiting critical questioning of local practice, institutions or power dynamics. In such contexts, 'integrated' approaches to sustainable resource management require skills beyond theoretical concepts, and beyond critical thinking, to include cultural sensitisation, strategic positioning and social learning.

Sustainable development requires systemic organizational changes in water agencies and utilities (Lozano et al. 2014), but many capacity development projects remain limited to training individuals, focus exclusively on technical expertise, or impose inflexible restrictions conceived by funders (Vallejo and Wehn 2016). Consequently, newly trained staff, equipped with multi-disciplinary skills, face opposition and difficulties effecting change at the organisational level, as innovative and creative solutions might challenge existing routines, procedures, and hierarchies. The importance of the receiving environment for successful capacity development interventions is acknowledged in principle. But our own projections, methods and mind-sets to training and capacity development are often complicit in retaining the *status quo.*

Strengthening the institutional aspect of capacity development requires more attention to the training approach itself. To make sustainability education of working professionals effective, we need to stop teaching, and start facilitating context-specific learning processes. The most successful projects in the review addressed individual and organisational capacity at the same time, and connected what participants learn with the purpose they learn for. Action learning approaches, particularly workplace related exercises based on real-life problems, have proven valuable for a wide range of organisations and fields of expertise. Course designs should see trainees return to their workplaces and engage colleagues as part of the process. However, interactions of working professionals with actual peers follow a different dynamic than exposure visits of students to companies. Action learning requires a safe learning environment; workplace-based action learning needs careful balancing of group work and organizational engagement.

To improve capacity development for sustainability, we need to invest more in the engagement of higher level stakeholders to improve the selection and availability of participants, which requires high political and cultural sensitivity. Donor agencies need to allow and enable more flexible project designs and evaluation, based on systems thinking and theories of change (Lozano et al. 2014). Educators themselves have to be flexible, open minded, and prepared to throw out 'off the shelf' trainings, and instead design and implement meaningful combinations of face-to-face and workplace learning that are adaptable and responsive to the training context. Composition and motivation of training participants will remain unpredictable, so content, tempo, activities and learning styles have to be adjusted as needed. However, flexible and adaptive project designs effectively co-designed with participants risk losing focus. Dynamic training programmes depend, therefore, on experienced project coordinators, capable of balancing continuous adjustment and evolution of activities, while keeping the process on track towards intended outcomes.

4 Training Sustainability Change Agents: Key Issues

The educational and capacity development programmes outlined above encountered three shared challenges in curriculum design: skill development for meaningful stakeholder engagement; integrating the normative and value-based aspects of sustainability; and securing sufficient organizational capacities and professional skills of educational providers. The following sections reflect the relevance of these experiences for ESD programme curricula in general. Table 1 summarizes the findings per issue area.

Table 1 Summary of curriculum-related findings per issue area

Case study	Findings related to curriculum and programme content per issue area		
	Build relational skills relevant for…	Integrate normative aspects to…	Institutional capacities critical to…
Sustainability Sciences MSc and PhD Programme, UNAM	• Facilitating multi-stakeholder processes related to implementation of public policies or national sustainability agendas • Collaborative planning processes	• Address local development priorities such as poverty reduction or inequality • Establish (professional) values necessary for achieving the SDG	• Initiate dedicated inter-disciplinary programmes focused on complex socio-ecological issues • Offer more competency-based programmes tailored to local professional demand
Environmental Sciences Joint MSc Programme, UNESCO-IHE	• Facilitating multi-stakeholder processes at different scales • Collaborative planning and decision-making in complex socio-ecological systems • Building trust and maintaining relationships	• Lay the groundwork for professional identity of future water managers • Reflect ethical dimensions of water management	• Develop systematic, coordinated competency development trajectories across multiple organizations • Ensure positive learning experience with coherence in content, didactics and exams
CD Programmes for Water Professionals, UNESCO-IHE	• Facilitating multi-stakeholder processes • Initiating and stimulating organizational change • Securing commitment from leaders, buy-in from staff and support from relevant external groups	• Address local norms and customs in the target region • Strengthen cultural sensitisation and strategic positioning	• Move contents beyond technical expertise towards action learning embedded in the work environment • Offer trainings that are adaptable and responsive to the local context

4.1 The Importance of Building 'Relational' Competencies in ESD

Stakeholder engagement is a cornerstone of sustainable development. MSc programmes in environmental and water management teach the importance of collaborative planning and decision-making, building trust, maintaining relationships and valuing the contributions of diverse actors. Similarly, transformative change in water utilities and ministries starts with securing commitment from leaders, buy-in from staff, and support from relevant external groups. Translated into competency needs for sustainability professionals, stakeholder engagement requires

combinations of interpersonal and communication skills, process (management) competencies, open-mindedness and a willingness to learn and adapt (hereafter summarized as 'relational skills'). In water management, the need for relational skills is widely documented in competency frameworks, educational reviews and case studies (Irvine et al. 2016; Lansu et al. 2013), policy analyses (OECD 2015), as well as IWRM guidelines and training materials (Global Water Partnership 2009; Kranz and Mostert 2010). Empirical case studies imply a similar priority for relational competencies in other sectors. Wesselink et al. (2015) identify a similar mix of interpersonal skills, open-mindedness and active engagement as crucial for corporate social responsibility. Stakeholder engagement skills are also increasingly acknowledged as core competency in urban planning and other engineering curricula (Halbe et al. 2015; Pijawka et al. 2013). A review of general sustainability competency frameworks (Barth et al. 2007; De Kraker et al. 2007; Hesselbarth and Schaltegger 2014; Wiek et al. 2011) reveals, however, that relational skills are neither understood as one integrated set of competencies, nor given the priority that their empirical importance suggests.

One reason for missing links between theoretical and workplace-specific competency frameworks might be that the term 'competencies' in education reflects two separate schools of thought. In educational philosophy, they serve to envision 'competent' citizens shaped by the educational system (Cheetham and Chivers 2005). In industrial human resource practice, competencies are technical descriptors that allow disaggregation of personal qualifications for recruiting and staff planning (Guerrero and De los Ríos 2012). Educational policy increasingly uses the latter concept, as exemplified by the European Bologna process (Danish Ministry of Science Technology and Innovation 2005). In contrast, the discourse on sustainability competencies originates from the philosophical question of skills enlightened citizens need to invent new sustainable lifestyles (UNESCO 2002).

Competencies are notoriously difficult to conceptualize and evaluate within a higher education curriculum (Allais 2007; Chabeli 2006). For example, it is not sufficient for sustainability professionals to understand or design participatory processes; they have to be able to *participate* and *facilitate* them. The simple term 'stakeholder engagement' describes highly complex social learning processes influenced by culture, attitudes and power (Latour 2004; Pahl-Wostl et al. 2011). Competencies include, therefore, the ability to account for tacit knowledge, social identities, and motivations of participants in reflexive dialogues. The UNAM experience shows that a competency-based approach can uncover inherent conflicts between professional and academic teaching objectives. In the literature, discussions of pedagogical approaches for sustainability frequently mention collaborative learning methods, but problem-based, active or 'action' learning is usually recommended to empower students and capture the complexity and interdisciplinarity of sustainability issues (Halbe et al. 2015; Hesselbarth and Schaltegger 2014), not to develop interpersonal and process facilitation skills. Much closer attention on cooperative teaching approaches that emulate social learning processes and systematically foster relational skills is recommended (Johnson and Johnson 2009; Pijawka et al. 2013; Weatherly et al. 2003).

4.2 Integrating the Normative Aspect of Sustainability Education

All three programmes explicitly or implicitly faced normative question during programme design, related to local development priorities, training paradigms, social norms, integrity and the priority of sustainability education as such. The arguments reflect that sustainable development has an inherent normative dimension; it is often described as 'moral precept', 'ethical consensus' or a 'dialogue of values' (Pijawka et al. 2013; UNESCO 2002). Consequently, offering ESD entails that universities actively and consciously participate in a socio-political transformation, which might cause controversy (Papanagnou 2010). Staff involved in new or specialized degree programmes will often share related values, but suggesting a normative sustainability agenda for existing disciplinary degrees might face outright rejection (Grindsted 2015). In terms of programme content, many supposedly 'technical' sustainability topics contain normative dimensions. Civil engineering has to accommodate value-based arguments of local communities, a demand that expert-led planning models struggle to fulfil (Halbe et al. 2015). In management education, ethics are subject to increasing debate (Sidiropoulos 2014) and behaviour-based approaches to policy making (The World Bank 2014) are based on awareness for mental models and value systems, but current understanding is limited. For example, aruments rarely acknowledge that the term sustainability itself carries different connotations in different languages and religious traditions (Jie and Moris 2012; Kwang-Hoon and Ko 2015). Addressing such normative questions in ESD curricula does not mean to follow a norm-based approach to teaching (Grindsted 2015); it means to *acknowledge* the role of values and norms in the future workplace of sustainability professionals.

These findings identify three different norm-related tasks important to ESD programme development:

Build a shared understanding of sustainability: Difficulty in defining sustainability leads to calls for unified definitions to avoid lengthy clarifications. But since human understanding is shaped by culture and personal experience, formal definitions have different interpretations, and identical ideas are expressed in different terms. Time invested in collaborative workshops as conducted in UNAM is, therefore, not wasted. Jointly developing an agreed 'local' sustainability definition and agenda builds trust, reveals hidden values and creates pre-conditions for successful collaboration and programme implementation (Pfeiffer and Leentvaar 2013).

Integrate teaching methods that prepare for 'messy' workplace realities: Problem-based classroom exercises are often characterized by attempts to represent all sides, balance positions and find compromise solutions. Few classroom role-plays feature fraud or bribery (unless prescribed), shouting matches, actors refusing to listen to a presentation, or parties outraged at carefully thought-through solutions. In contrast, real-world decision-making is frequently biased by power and personal affiliations, and dominated by greed, self-interest, or intransigent positions rooted in fear or ideology. Teaching methods should help prepare students

for the reality of sustainability professions, for example through analysis of complex historic decision-making processes, story-based and emotion-evoking case studies that bring multi-faceted and subjective arguments to the classroom, as well as journaling exercises that reveal own personal values to students.

Discuss core values of sustainability professions: It is increasingly recognized that education plays an important role in how students envision and judge personal conduct in their chosen profession (Gantt and Madison 2015). As many sustainability professions carry inherent social responsibility, ESD programme development should include discussions on the core values, motivations and behavioural expectations of the professions trained. Values might include an identity as change agents, acting with integrity, or the ambition to learn from failures (Brundiers et al. 2010; Myers et al. 2014). Methodically, it means to abandon the idea that information leads to knowledge which leads to behavioural changes. Newer research shows that students and professionals seek information on topics they care about. Supporting professional identity formation ultimately means teaching and *learning to care* about sustainability.

4.3 Building Institutional Capacities for ESD

The ESD programmes observed for this study involved interdisciplinary, inter-organizational and international collaboration; modules based on complex real-world problems; flexible and adaptive training designs; and collaborative learning approaches. Every case placed high demands on the educational institutions during the design process. Throughout implementation, collaborative programmes required extensive coordination; joint programmes in particular demand substantial investment in continued quality assurance. This observation corresponds with observations in the literature that the amount of time needed for ESD programme development is easily underestimated (Aktas et al. 2015). Accordingly, the assessment of organisational capacities and professional skills of education providers themselves are a crucial element of ESD programme development.

Competencies and professional skill development of educators requires particular attention. Faculty might lack knowledge about sustainability, or awareness for disciplinary differences. Aktas et al. (2015) document teachers learning the basics of sustainability alongside their students. Capacity development requires educators equipped with tools for mentoring and on-the-job-learning, intercultural communication and change management. To build institutional capacities for ESD, faculty in new interdisciplinary courses might consider ‘taking their own course’ before rolling out programmes for students—a time-tested practice in industry and more recently introduced in development collaboration. Updating teaching and learning techniques from e.g. a certified University Training Qualification (UTQ) supports the necessary professional skill development in third level educators.

4.4 Lessons for ESD Programme Implementation

Discussion of the three issue areas revealed a clear parallel between key issue areas in the ESD curriculum content and key success factors for the design process and programme implementation itself. Design of the UNAM sustainability science programme and the UNESCO-IHE joint masters was based on extensive multi-stakeholder processes, and required significant relational skills of coordinators to overcome disciplinary divisions and conflicts of interest. Similarly,

Table 2 Summary of programme development and implementation-related findings per issue area

Case study	Success factor for programme development and implementation		
	Build relational skills relevant for…	Integrate normative aspects to…	Institutional capacities critical to…
Sustainability Sciences MSc and PhD Programme, UNAM	• Facilitate cooperative programme design with academic units and external agencies • Ensure buy-in of faculty, and overcome disciplinary divisions and conflicts of interest • Ensure continued coherence and evolution of programme	• Identify conflicting priorities in training for academic and professional career • Build trust and reveal unconscious values to allow collaboration • Reflect local and regional development priorities in the curriculum	• Interdisciplinary collaboration and didactics • Competency based MSc programme design • Extensive collaborative programme design for dedicated local and regional ESD programmes
Environmental Sciences Joint MSc Programme, UNESCO-IHE	• Facilitate cooperative programme design with international partner institutions • Overcome differences in didactic approach, structure, standards, culture and expectations • Ensure continued mutual quality assurance	• Reflect norms and values embedded in teaching and training approaches • Align educational standards across different cultures	• Address increased coordination demand of international collaboration • Offer effective administrative support for students moving between institutions
CD Programmes for Water Professionals, UNESCO-IHE	• Facilitate cooperative programme design with trainers, beneficiaries and stakeholders • Cooperate with higher level stakeholders to improve participant selection	• Identify value conflicts between sustainability ideals and local customs • Address local power dynamics and institutions • Reflect projections and mind-sets embedded in CD programme design	• Address methodical requirements of workplace education and facilitation of autonomous learning processes • Offer effective project management balancing needed flexibility with outcome-orientation

successful UNESCO-IHE CD projects were typically those that were co-designed by trainers with beneficiaries and stakeholders. Discussions related to norms and values not only questioned priorities and professional identities of future water managers, but also the awareness of teachers and programme coordinators for norms and values embedded in teaching and training approaches.

Water and environmental management courses extensively address the importance of process coordination in classrooms, while programme coordinators work with very limited resources, rarely receive professional training in network management, and often depend on working groups of interested volunteers. Research shows that effective network management affects the outcomes of knowledge and implementation networks (Klijn et al. 2010), but is rarely systematically considered in interdisciplinary programme development. External standards such as the European Bologna framework can support collaboration and quality assurance in higher education, but usually demand additional formalisation and documentation. In joint degree programmes, organizational capacity to link administrative systems of partner institutions is a key factor to ensure a positive learning experience for students. Capacity development programmes expand requirements placed on coordinators to include negotiations with beneficiaries and funding agencies (frequently in politically sensitive contexts) and the execution of capacity needs assessments to inform programme design, adding strong project management skills to the list of required competencies. Table 2 summarizes how the three critical issue areas applied to programme development and implementation in the three case studies.

5 Conclusions

Lessons learned in three different types of higher education programmes, and discussed in the light of current ESD research, suggest including three important components into ESD programme development:

(1) In the training of sustainability professionals, skills and competencies necessary to successfully build, maintain and manage relationships and stakeholder engagement require increased attention. Embedding such aspects into ESD is supported by programme designs that use cooperative learning methods, and competency profiles to clarify expectations, bridge disciplinary boundaries, reveal conflicts and support inter-organisational collaboration.
(2) Programme development should openly discuss and address the normative component of sustainability education, including clarification of guiding values for the programme, method selection appropriate to prepare for real-world workplaces, and discussion of core values of sustainability professions.
(3) Programme development should include a systematic assessment of organizational and professional capacities available for the programme, ensure effective programme coordination, and invest in professional and didactical skill development for staff involved in sustainability education.

Further research is needed to clarify the conceptual categories suggested in this study. In particular, improved theoretical frameworks for sustainability competencies are needed, including an investigation of differences between general sustainability education, and training of sustainability professionals. A better understanding regarding the role of norms and values in ESD is also required, particularly with regard to teaching methods suitable to address normative questions in different contexts.

The most remarkable lesson of this analysis is that key issue areas suggested for ESD also apply to the development process itself. This strongly suggests that successful ESD programme development might well start with 'learning and applying what we teach' in sustainability education.

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