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Transforming Teacher Education for the 21st Century: Developing Relevant Competences for a Changing World

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Abstract: The UN adopted the sustainable development goals in 2015 and emphasized that education is a powerful driver for achieving them by ensuring an inclusive quality education and promoting life-long opportunities for all. Thus, for teacher education programmes to be relevant, it should develop the capacity of teachers to achieve these two objectives. This paper documents the development and implementation of an ESD teacher education programme in Southern African. The paper argues for empowering the 21st century teacher with appropriate ESD compliant resources coupled with an integrated pedagogical approach into "agents of change" who are essential for the transformation of learning processes in Southern African. Furthermore, it will provide insights related to the relevance of the programme in Southern African and will highlight the issues and challenges faced with regard to existing institutional and national education policies. A mixed methodology approach was adopted using a participatory action research through multiple case study model drawing from data generated through personal experiences, interviews, observations and documents analysis, sample in-depth cases of practitioner experiences were constructed. The paper will use a selected case study to illustrate the transformative teaching and learning approaches. Based on these findings, some practical recommendations for better results are discussed and a suggestion is included for future research.

Key words: 21st century teaching, education systems, agency, capacity development

1. Introduction

Since 2012, the Swedish International Centre of Education for Sustainable Development (SWEDESD) and Southern African Development Community (SADC) have collaborated in mainstreaming Education for Sustainable Development (ESD) in teacher education through a project called Education for Strong Sustainability and Agency (ESSA). The ESSA Project for teacher education aims at supporting the SADC region to integrate sustainable development priorities into their teacher education programmes. It also aims to strengthen implementation of the SDGs, especially Goal 4, which seeks to "ensure inclusive and equitable quality education and promote life-long learning opportunities for all". The ESSA project's emphasis is on target 4.7 of Goal 4, which states that "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and

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appreciation of cultural diversity and of culture's contribution to sustainable development." In addition it is also expected to contribute to achieving Goal 12 — ensure sustainable consumption and production patterns and Goal 13 — take urgent action to combat climate change and its impacts. The world finds itself in a context of globalization and accelerated technological change resulting in increasing global and local challenges, all of which demand a different educational approach that matches the pace of change in order to meet the demands for sustainable and equitable development.

2. Global and Local Challenges in the 21st Century

Humanity is in agreement that ever increasing consumption levels and changing lifestyles are putting pressure on the earth's valuable resources and this in turn puts pressure on society to create a sustainable future as a matter of urgency. In November 2015 world leaders unanimously agreed on 17 Sustainable Development Goals (SDGs), which accentuate the need for a different kind of development that leaves no one behind and gives everyone a fair chance of leading a decent life.

The challenges that young people will face when they graduate from school and college with the view to strengthening the relevance and quality of teacher education courses. The increasing sustainability challenge cannot be overemphasized. Recently, Thomas Frey (2016) alerted the world that 2 billion jobs will disappear (roughly 50% of current jobs on the planet) by 2030. Writing on the same subject Rachael Brown (2015) argued that sixty per cent of Australian students are training for jobs that will not exist in the future or will be transformed by automation. Southern Africa region is most vulnerable to environment and sustainability challenges of which employability and climate change are most overwhelming because the majority of people in this region rely on climate-dependent agriculture and local natural resource base for sustenance and livelihoods. Accelerated natural resource depletion, access to clean water and sanitation, pollution and increasing levels of poverty are issues that showcase the complexity and the systemic nature of the challenges in the region. When considering the relevance and quality of education it is important that this reality is projected as an eye opener to how quickly the world is changing without painting a picture of doom and gloom.

Although hundreds of millions of current jobs will disappear many other sectors will also be affected. Most of the jobs getting displaced are low-level and our challenge as educators will be to prepare young people with the kind of thinking relevant for the skills demand of the coming era. The International Commission on Financing Global Education (2016) said in their latest research, unless education can respond to the rapid local and global changes a major shortage of skilled workers will stunt growth (positive change); up to a quarter of the Low Income Countries (LICs) population could still live in extreme poverty; and income inequality will increase fuelling conflict and instability. Although it won't be an easy road ahead it will be one filled with huge potentials in tandem with the global shift. The Project realized the urgent need for the education system in Southern Africa to empower young people with the competences that inspire them to play a pivotal role in the trajectory of the continent, an education model that cannot be business as usual.

3. Educational Responses to the Challenges

Teacher education programmes are conceptualized and developed to help educators meet the requirements of the school curriculum. Teacher education programmes are currently discipline oriented. They are delivered in a fragmented approach in the sense that science educators follow the Science programme which is different from

the Languages/Social Sciences ones. In some cases there is a common core for all disciplines which relate to educational theories. There have been initiatives to "infuse" the concept of environment in the early 1980s-1990s. Much debate has been taking place around the concept of interdisciplinary teaching and learning within both school curriculum and teacher education programmes. But when it comes to actual implementing, the issue of discipline bias comes to the frontline. Today the debate on education is shifted towards sustainability which is a complex concept and requires a rethinking of education systems around the world. Making our school curriculum and teacher education programme sustainability compliant remains a challenge of the present century.

In this paper, while referring to quality we shall include effective teaching and learning practices in classes, relevant and contextualized resources including technology-based ones, fair assessment practices, sustained interest among learners for lifelong learning opportunities, partnerships of schools with potential stakeholders and finally teacher preparation/development.

3.1 Learners of the 21st Century

Given the complex challenges cited earlier, learners of today's world should be given opportunities to engage in a holistic development with a view to seeking integrative thinking and practice. Learners across the world, particularly in the Southern African region, should be supported to become problem solvers, strategic and creatical (creative and critical) thinkers. They should be envisioning change which seeks alternative future scenarios, learn from the past and inspire engagement in the present and yearn for transformation so as to change the way they do things and change the systems in which the learners learn.

Children in Southern Africa need a kind of education that empowers them to play a pivotal role in the trajectory of the continent, an education model that cannot be business as usual. The fact is education can open new opportunities for children yet it is far from providing such opportunities. An alternative kind of education will yield significant benefits for both African young people and society as a whole; enabling employability and innovation/creativity that may result in job creation and job prospects, improved quality of life and greater economic and social development. There is a need for a paradigm shift in our educational models especially in Southern Africa. We should provide these children, adults of tomorrow, with skills that are relevant to meet up with the challenges of the 21st century.

Today we are all connected through the media and information technologies. The focus is about "getting information to people" with a view of making our learners informed and aware of the diverse challenges. We should now move towards "getting people together" with information so that learners deliberate problems and strive to bring about change to resolve the issues they have at hand. In this way, as stated by O'Donoghue (1999),

> "The resolution of complex socio-economic, environmental and sustainability issues could be downloaded to community learning contexts of social learning in which the problems become evident."

To attain these targets, educators should develop competences at four distinct levels: knowledge, practice, pedagogy and people engagement which reconcile with knowledge, values, ethics and actions. To uphold quality and relevance, our education system should support learners with 21st century competences that will prepare them for a rapidly changing world.

3.2 21st Century Competences

In the UNESCO report "learning: the treasure within" (UNESCO, 1996), Jacques Delors (1996) recognized four pillars for education of the 21st century; learning to know, learning to do, learning to be and learning to live

together. These pillars correspond with the frequently used competence fields: domain competences, methodological competences, personal and social competences.

The concept of competence is understood diversely in diverse contexts. It is sometimes understood as social competences, "soft skills", cross-curricular competences or dynamic skills. It is also interchangeably used as qualification or standard. The OCED (2005) identified three fundamental competences namely; competences for use of interactive tools such as knowledge, media and resources, autonomy, competences to interact with socially heterogeneous groups.

The essential competences, which need to be developed among the 21st century citizens, should also extend to our educators and teacher educators. ESD in higher education, including teacher education, is not simply an accommodation of sustainability issues and concepts or an "adding on" of sustainability information. It is about revisiting our priorities in our teacher education programmes/courses, reorienting our community of practice, rethinking our methods so as to focus on sustainability imperatives. ESD should be the driving principle and philosophy of all education system. It should not only limit to an interdisciplinary and holistic approach but it should be rather aiming at making learners at all levels of education competent to identifying and comprehending the challenges the world is facing, to adapt and cope with these challenges, to find alternative ways and methods to do things so as to mitigate the impact of these challenges.

Teachers have so far provided learners with, content, facts, dates and formulas while learners had to remember, recall and insert all these in their examination scripts. We live in a world where remembering information is no longer as important as it used to be because information is at our fingertips all the time. Learners can find information on anything, anywhere and anytime. Teachers are no longer the only and main source of information. Then is the role of the teacher in this 21st century not obsolete?

We argue for new teaching and learning approaches as transformative learning instruments for creating sustained efforts to build capacity for mainstreaming ESD in teacher education institutions. In addition, with the advent of the Global Action Programme (GAP) such initiatives offer a platform for launching large scale ESD mainstreaming in teacher education practices in ways that are contextually situated and globally connected. Southern Africa is one region most vulnerable to environment and sustainability risks. There is therefore a strong need for teaching and learning approaches that lead to a different way of thinking and acting which result in transforming society. To do this our teacher education programmes should consider sustainability key competencies (Wiek, Withycombe & Redman, 2011) given below.

- Systems thinking
- Anticipatory competence
- Normative competence
- Strategic competence
- Interpersonal competence

These key sustainability competences are described in Figure 4 below.

3.3 Educational Policy Responses

To empower our youth and the world population in facing current and future challenges documented above, there is a need to rethink about the education agenda. As stated by the director general of UNESCO[1];

[1] http://en.unesco.org/news/education-connects-peace-and-development-sustainable-ways-says-director-general-unesco-week.

> We need new forms of education that promotes understanding between cultures, that strengthens the resilience of societies and provides the relevant skills to navigate the future, "emphasizing the need to promote human rights, dignity, diversity and inclusion". We now have to reinforce efforts, translate results into educational practices, into teacher training and into concrete transformations of curricula. To succeed, we need teachers equipped with the skills and confidence to foster these competences.

The statement highlighted above captures the types of teacher education responsive to the educational needs of our youth. The emphasis should not be limited to providing access to education for all children, but it should also cater for the quality of education we are providing them with. Quality education is a broad term which needs to be defined. It relates to readiness of learners, conductive classroom environments with adequate resources, relevant content for developing knowledge, skills and attitudes, trained teachers capable of implementing learner-centred teaching approaches with faire assessment strategies to reduce disparities (UNICEF, 2000). To achieve these in our classrooms, we need to have educators to act as "change agents" who are capable to make the relevant change from the practices of teaching. There is a need to formulate and/or review educational policies, particularly those related to teacher education. Thus the sections which follow will document the policy responses towards teacher education for sustainable development.

3.4 International Policy Responses

This section will describe policy responses from international and regional organizations having including UNESCO, SWEDESD, SADC REEP, MESA-UNEP, IOC and finally a joint venture between 2 regional organizations, namely SADC REEP and the SWEDESD.

- The United Nations

In 2002 the United Nations (UN) through its General Assembly declared 2005–2014 as the decade of education for sustainable development. UNESCO was entrusted with the responsibility to lead the decade. The decade aimed at enabling world citizens to face present and future challenges in one hand and to empower leaders to make relevant decisions for a viable world. These aims were to be achieved by providing the actors from all contexts with opportunities to acquire

> "various skills (critical and creative thinking, communication, conflict management and problem solving strategies, project assessment) to take an active part in and contribute to the life of society, be respectful of the Earth and life in all its diversity, and be committed to promoting democracy in a society without exclusion and where peace prevails." (The UN decade of education for sustainable development, The DESD at a glance, UNESCO Report, p. 4)

To achieve this, the decade laid emphasis on promoting and improving quality education, re-orienting educational programmes, building public understanding and awareness, and providing practical training. Thus we need educators both from the formal and non-formal sector to rethink over their practices.

The decade has enabled national governments to rethink their education policies whereby challenges in terms of change, complexity, controversies and uncertainties are being addressed. As a result a wide range of approaches are proposed including systems thinking, values-based, problem-based critical and social-based learning. Today sustainability issues are not seen just as an added segment of the curricula but seen as an opportunity to rethink the education agenda. As stated in UNESCO (2016) cited in the Visby Recommendations for enhancing ESD in Teacher Education (SWEDESD, 2017):

Many countries have made an effort to reform their national curriculum on education, as well as to implement values of Sustainable Development. Some examples can be shown from the following countries:

Europe: Croatia, Estonia, France, Iceland, Malta, Portugal, Serbia and Sweden. Sub-Saharan Africa: Gambia, Mauritius, Namibia, Rwanda and Zambia. Latin America and Caribbean: Chile, Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Peru (SWEDESD, 2017, p. 28).

ESD is universally recognized as a driver for quality education and a key enabler for sustainable development. Global action programme (GAP) for ESD was endorsed for ESD agenda post 2015. The objectives of the GAP are:

> to reorient education and learning so that everyone has the opportunity to acquire the knowledge, skills, values and attitudes that empower them to contribute to sustainable development.
>
> to strengthen education and learning in all agendas, programmes and activities that promote sustainable development.

The following priority areas within the education agenda for post 2015 are identified: advancing policy, transforming learning and training environments, building capacities of educators and trainers. These priority areas would ensure that ESD is mainstreamed into both education and sustainable development policies, integrate sustainability principles in education and training and build capacities of educators and trainers to effectively deliver ESD. (UNESCO website, http://en.unesco.org/gap/goals-and-objectives)

- Southern African Development Community

The aim of the Southern African Development Community Regional Environmental Education Programme (SADC REEP) is to provide environmental education (EE) practitioners in the SADC region to strengthen environmental education processes for a fair and sustainable management of the environment. This aim is supported by developing appropriate EE policies, effective networking among EE practitioners of the region, EE resource materials, capacity building workshops and courses. The SADC REEP is also engaged in promoting research on EE and ESD related issues.

The SADC REEP has partnered with Rhodes University in South Africa to run an international EE course for practitioners within the region. The course, initiated since 1998, engaged participants to reflect on environmental issues and risks and unsustainable practices from different contexts of the region and the policy responses towards these risks and unsustainable practices. The course also enables participants to mediate for methods of effective learning and also in reflexive application of EE change projects and programmes.

- Indian Ocean Commission

The Indian Ocean Commission (IOC) is a regional organization of Small Island Developing States (SIDS) of the Indian Ocean. These SIDS include Madagascar, Mauritius, Seychelles, Maldives, Comoros, Reunion (French colony). The commission is involved in many EE and ESD related projects. It has over the years funded and piloted several EE and ESD projects for both formal and non-formal education. At the formal level, the IOC has worked closely with higher education institutions such as the University of Madagascar, University of Reunion, University of Seychelles, University of Mauritius and the Mauritius Institute of Education. The main objective of partnering with these institutions is to support them both financially and with the expertise in developing contextualized and relevant regional/national/local EE and EE+SD resources. Recently under the ISLANDS project, the IOC has initiated activities related to climate change, disaster risk reduction[2].

- Mainstreaming Environmental and Sustainability in African universities (MESA)

[2] http://31.222.186.27/moodle/pluginfile.php/792/mod_resource/content/3/brochure_ISLANDS_en_finale_13.pdf.

The United Nations Environment Programme (UNEP) together with other partners have mainstreamed environment and sustainability in teaching, research and community engagement in African universities under a project called MESA. It aims at scaling the United Nations Decade of Education for Sustainable Development. It also supports the New Partnership for Africa's Development (NEPAD) environmental action. In the southern African context, MESA contributes to the implementation of SADC Regional Indicative Strategic Development Plan (RISDP which aims at integrating environmental and sustainable development issues into socio-economic planning. A training programme with a toolkit of flexible materials for use by African academics to conceptualize and plan for multi-disciplinary ESD Innovations in a range of University disciplines has been developed and is in use.

The MESA ESD Innovations Programme (and materials) produced through the MESA Universities Partnership have been used in the development of the SIDA/Ramboll Natura Education for Sustainable Development in Higher Education International Training Programme (HESD ITP) which has involved academics from African universities working with colleagues in Sweden and working with their colleagues in their home countries and universities. This is an indication of the importance of the MESA Programme's contribution to the growth of ESD in universities in Africa. Thus the three MESA Chairs will serve as prime means of capacity building through the exchange of knowledge and sharing in a spirit of solidarity. These will promote north-south and south-south cooperation as a strategy to enrich institutions in southern Africa and beyond. The three Chairs will be the first MESA Chairs in Africa. SADC REEP already has a good network of universities, NGOs and governmental organizations that are working on the DESD. Activities such as research, materials development, policy processes, networking and training undertaken by SADC REEP in southern Africa have been significant for strengthening orientation and direction, and for contextualizing EE/ESD discourses in relation to local environmental issues experienced by schools and their communities, and the education system as a whole. Thus the MESA Chairs will open avenues for the higher education community to join forces with MESA/ UNESCO partners to achieve the objectives of the global and local agenda.

Three universities have been assigned the MESA Chairs. These are University of Botswana, University of Swaziland and University of Zambia. The interventions have been developing ESD innovative toolkits aiming at strengthening capacity to bring in innovation to addressing ESD in universities. Regular seminars for students, university leaders and policy makers to situate the progress on their respective universities and more importantly to provide opportunities to African countries to integrate ESD into educational reforms and to strengthen networking among African universities and beyond through the setting up regional centre of excellence. Through these chairs, initiatives were taken to develop and run new courses on ESD such as at the University of Zambia, a Bachelors' and Masters' in EE Courses were developed. The same university organized the first SADC Regional Cluster ESD Course for Teacher Educators.

- Southern African Region Universities Association Climate Change Education

The Southern African Region Universities Association (SARUA) Climate Change Capacity Development Programme seeks at:

> "Creating a system of knowledge co-production that provides southern African researchers with opportunities for capacity building and relevant, high quality knowledge production on climate compatible development" (SARUA, 2014).

The programme aims at enhancing the climate adaptive capacity and resilience of the SADC region through the development of a collaborative network of higher education institutions capable of pooling resources, maximizing the value of its intellectual capital and attracting significant investment into the region. The programme will involve teaching, research knowledge production on climate change, policy development and active participation in international policy networks.

- The ESSA project (SADC and SWEDESD)

The Education for Strong Sustainability and Agency (ESSA) Project for teacher education (the Project) aims at supporting the SADC region to integrate sustainable development priorities into their teacher The SWEDESD-SADC ESD Programme acknowledges that developing core subject knowledge and understanding are essential for 21st century skills implementation. In order for learners to think creatively, critically and communicate effectively they must build on a base of core subject content. For this reason, core subject content has been suggested as a bedrock component of mainstreaming ESD into teacher education.

The content of the SWEDESD-SADC ESD programme has emerged from our collaborative effort to analyze necessary skills and competences for the transition towards a sustainable society. We have tried to address what the “relevant skills essential for a rapidly changing world” could embrace and translated that into a number of key concepts that together could form an understanding of sustainability. These concepts create a deeper awareness of being connected to our life supporting ecosystems and demonstrate necessary elements in building a fair, just and equal society. As shown in Figure 2, many of them also hold “holistic dimensions” in the sense that they amalgamate perspectives from different subject areas or bring together natural and social sciences. The crucial task is to arrange these holistic concepts into themes/units in such a way that they hold relevant sustainability dimensions and at the same time can be taught with classroom examples that are within traditional subjects.

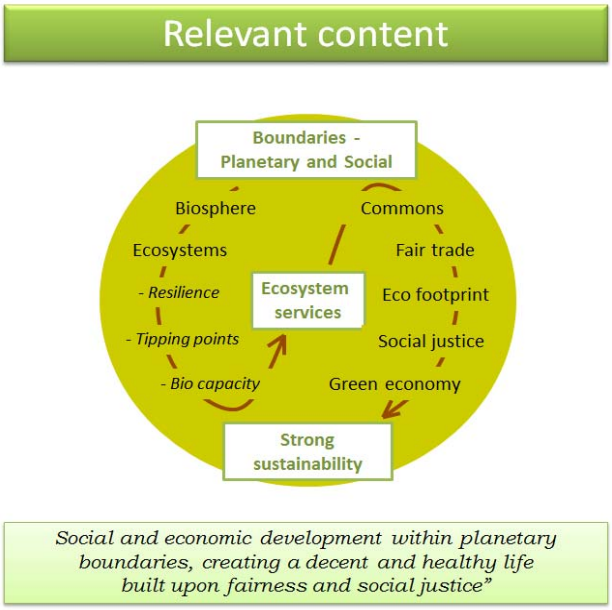


Figure 1 Relevant Content

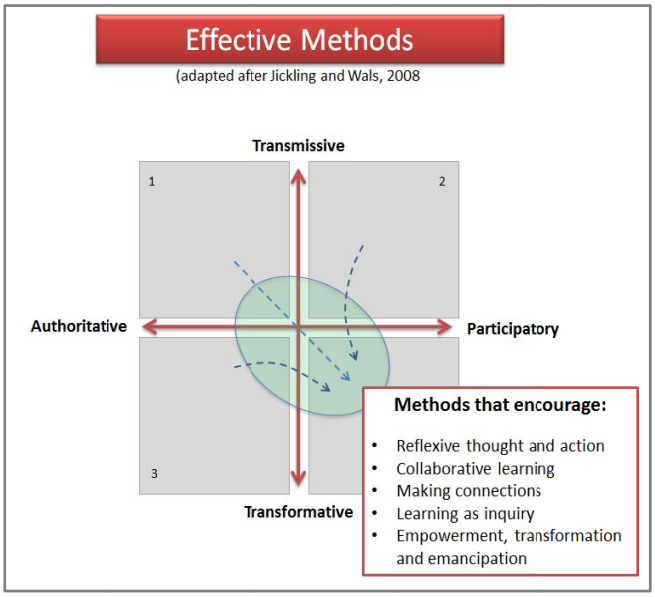


Figure 2 Effective Methods

3.5 Effective Methods

In the SWEDESD-SADC ESD programme we have experimented with the most effective methods which have helped us to facilitate a pedagogical shift of teaching and learning from transmissive and authoritative approaches towards participatory and transformative. To achieve this we have relied on the work of Jickling and Walls 2008, to facilitate this transformation. We have made a concerted effort to use examples and approaches that encourage:

- reflexive thought and action
- collaborative learning
- making connections
- learning as inquiry, and
- enabling empowerment, transformation and emancipation (Figure 3).

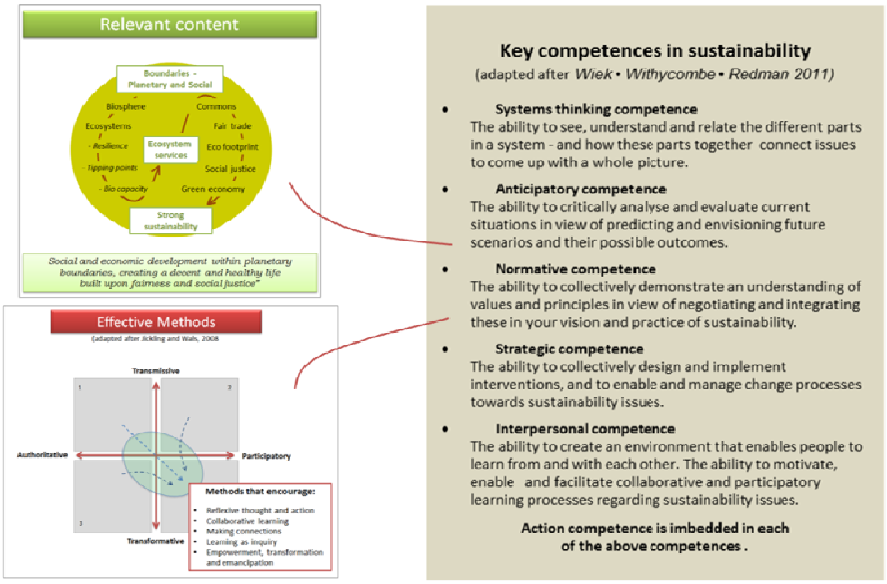
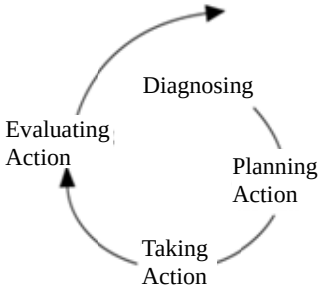


Figure 3 The Fundisana ESD Navigation Tool

By combining a certain content with selected methods we are developing specific competences that are necessary for the 21st century teaching and learning. The SWEDESD-SADC ESD programme has also taken a serious stance in blending theory of learning and the practice of teaching and learning such that teacher education will use the same methods in their own teaching as they wish to see teachers employing in their classrooms. These are the same methods that we believe have the potential to steer teaching and learning (through teacher education) from being transmissive and authoritarian to transformative and participatory as shown in figure above.

3.6 The Education Navigation Tool

To provide access of this programme to a wider audience within southern Africa, the three ESD fundamentals of relevant content, effective methods and desired competences were combined to establish the Education Navigation Tool as shown in the Figure 4 below.



Cycle

Figure 4 Action Research Cycles

- the essential competences required for contributing to the development of a sustainable society sustainability
- the relevant content required to respond to environmental degradation, social instability and lack of equity; and
- the most effective pedagogy or methods that have the potential to steer teaching and learning from being transmissive and authoritarian to transformative and participatory

This navigation tool was used to develop an online teacher education course, the Fundisana Online, and classroom examples and inspire course participants to refer to it

4. Why Teacher Education?

The challenges of the 21st century demand societal transformation, which may only be realized through the active participation of competent citizens. The project is based on the premise that the 5 key competencies described above (Figure 4) are a combination of knowledge, capability and readiness of the individual to cope successfully and responsibly with changing situations. This then makes it a requirement for teachers to pick up competences for teaching sustainability. According to Jurgen Rost (2010), you can't communicate competences, they have to be developed. Competences must therefore be regarded as learnable but not teachable (Barth et al., 2007). The purpose of the SWEDESD-SADC ESD Programme is to contribute to the integration of ESD into teaching practices to demonstrate how these competences may be acquired through teaching and learning initiatives that may be feasible to replicate in the various classrooms, schools and communities. As an on-going

reflexive process, the programme is promoting reflection, discussion and creation of innovative practices that calls for all teachers to participate in transformative learning beyond the 2015 global ESD agenda, i.e., way into the Global Action Programme on ESD (GAP) activities that contribute to the shaping of sustainable societies. This, in anticipation of making a contribution to Priority Area Three of GAP, which deals with increasing the capacity of educators and trainers

The programme recognizes that teachers play a key role in the suitable socialization of young people for sustainable development. It is important that, irrespective of the academic subject matter for which a kindergarten, primary or secondary school teacher is responsible, the teacher's overall responsibility be seen as the moulding of socially and emotionally well-adjusted individuals. Teachers and educators are in direct interaction with children, parents and their communities and they are looked upon as the individuals who can stimulate positive changes in the lives of people and local communities. These teachers and educators are seen as natural leaders who can give advice on various affairs of the communities; they are therefore natural change agents for a sustainable society.

The SWEDESD-SADC ESD Programme focuses on the institutionalization of ESD approaches in partner teacher education institutions with the view to developing the 5 key competences to compliment the relevance and quality of teaching and learning in the schools. Consequently the programme aims at empowering teacher educators with capacity for adapting/adopting new approaches, proficient in developing knowledge, skills and values that enable learners to contribute to a sustainable society. The ultimate goal is therefore, to increase the quantity and quality of teachers who are capable of teaching for the 21st century, teachers capable of facilitating relevant knowledge acquisition, skills development and values that empower learners with competences essential for a sustainable society.

The following research questions guided our study:

- How can we prepare teacher educators and teachers with professional competences that meet the local and global challenges of the 21st century and beyond?
- To what extent teacher education institutions are empowered to adopt teaching and learning approaches that develop competences to meet the local and global challenges of the 21st century and beyond?
- What are the opportunities and challenges which teachers would face to mobilize these competences and why?

5. Methodology

5.1 The Philosophy behind the SWEDESD-SADC ESD Programme

Between 2011 and 2014 the ESD teacher education project coordinated a collaborative partnership among 42 universities including colleges of teacher education within the SADC region, building upon the current rich and fertile ground of regional networks and competences within the SADC. Using the Education Navigation Tool, SWEDESD and SADC REEP collaborated in initiating "change projects" aimed at mainstreaming ESD in teacher education by merging research and practice in a series of action research cycles.

We have found action research to be a powerful exploratory tool for teacher educators to inquire about educational problems and to improve their knowledge of teaching practice and that of their student teachers. The most explicit developments can be perceived through our experience and reflections as well as those of our colleagues while integrating ESD in their work. Qualitative research methods were used to analyze the integration of ESD in teacher education by initiating "change projects" in order to understand what the teacher educators

learned through the process and how their self-study impacted teaching and learning in their classrooms.

5.2 Epistemology — Theory of Knowledge

Action Research is based on the epistemological understanding that knowledge is socially constructed and plural. In this research we highlight the importance of reflexivity in the transformation of teacher education through the implementation of "change projects" in order to continually question current assumptions, current pedagogical approaches and assessment of teaching and learning. Participatory action research was therefore used to interrogate current teacher education practice in order to change and improve it, from the current, i.e., a practice of "as it is" to a pointer of a practice "as it could be" (Perret, 2003).

We made use of a variety of methodological process(es) known as the Action Research Cycle(s) (see Figure 4) originally developed by Kurt Lewin (1946) who viewed this research methodology as cyclical, dynamic, and collaborative. Through repeated cycles of planning, taking action, and reflecting, individuals and teacher education teams engaged in implementing changes required for social transformation. To extend this notion, Kemmis and McTaggart (1988) view action research as a collaborative process carried out by those with a shared concern. Although action research cycles seem to be neat and organized, in our case it was not a rigid structure but rather a more fluid, open and responsive process (Koshy, 2005).

5.3 Research Cycles

According to Alsop, Dippo, & Zandvliet (2007), it is possible for practitioners (teacher educators and teachers) to closely examine their role as "change agents" and decision-makers through their own problematization of the teaching and learning processes within their work contexts, and through their own reflexive practice (Hong & Lawrence, 2011). As a way of enabling teacher educators to interrogate their current practice, we used a four-step cycle (see Figure 4) of action research developed by Coghlan and Brannick (2001). According to Coghlan and Brannick, Action Research projects often use two cycles: a "core action research cycle", which refers to the aims or content of the research project and a "thesis action research cycle" or "meta-learning cycle" which relates to how the project itself is implementing. In our case the core was transforming teacher education practice in a way that develops essential competences for sustainability and the first step was the development of cutting edge examples of how we should be teaching for the 21st century. The meta-learning cycle was the implementation of transformative teaching and learning in the form of "change projects" to mainstream quality and relevance in teacher education. A third cycle (Figure 5) is emerging within the meta-learning cycle, i.e., the development of an online platform for teacher educators, Fundisana Online, to be accessed by the wider ESD community in southern Africa.

5.4 Data Generation Methods

We collected and examined final reports of participants' "change project" and reflections along with the student teachers' work and outcomes collected throughout the action research project. Our goal was to use their reports to better understand what student teachers learned through the implementation of their change project and how this self-study impacted teaching and learning, and student teacher outcomes. To ensure validity during our inquiry, we worked independently to review the change projects, and then met face-to-face with the deans and the teacher educators to work collaboratively and interactively as a "self-study community" (Kitchen & Parker, 2009). During these face-to-face discussions we reviewed their reports to determine the extent to which participants met project requirements and whether the feedback received for project implementation was an appropriate indicator

of learning outcomes.

While examining the action research process, we looked across all 42 “change projects” developed in cycle 2 using the method of constant comparison and recursive analysis (Glaser & Strauss, 1967) to identify patterns between and among the sources (Taylor & Bogdan, 1984). A critical examination of the ”change project” reports was carried out with the view to better understand how teacher educators and their institutions can best be empowered to implement teaching and learning approaches that meet the local and global challenges of the 21st century and beyond. In order to complement the review of “change projects” and to ensure validity, we also made use of critical friends to meet institutional project leaders face-to-face and generate data in a collaborative and interactive approach. A critical friend appointed by SADC REEP visited each “change project” institution to facilitate the face-to-face discussions, which reviewed the project report, lesson plans, and other artefacts related to the project, to co-determine the extent to which participants were using ESD initiative to transform their teaching and learning.

First, they examined the project description and content to identify specific planning and implementation processes. This was followed by a critical discussion with the project leaders using an evaluation form. Data from the evaluation forms was then analyzed by the University of Botswana (Ketlhoilwe Silo, & Boikhutso, 2014), to extract and identify categories, which we used to group narrative elements of the “change projects” to synthesize emerging findings.

5.4.1 Cycle 1 — The Core Action Research Cycle — Development of The Parts and the Whole

The diagnosis research question for cycle 1 was “How can current teaching and learning be transformed in order to respond to the 21st century challenges?” To answer this question, we organized a planning dialogue with 12 colleagues from five universities, two from Sweden and three from SADC. The action following this dialogue resulted in the development of classroom examples utilizing the experience of practicing teacher educators from Swedish and SADC teacher education institutions. The output was a publication, *The parts and the whole; a holistic approach to environmental and sustainability education, 2012*. This publication was and is still being used by participating institutions as a starting point in discussing the integration of ESD into teacher education and it was also used as the main document for discussions in cycle 2. Colleagues from Sweden and the ESD community in southern Africa did an evaluation of these examples in a workshop at the Environmental Education Association of Southern Africa (EEASA) Conference at Rhodes University in 2012 and the recommendations were carried into cycle two.

5.4.2 Cycle 2 — The Thesis Action Research Cycle/Meta-Learning Cycle” — Change Project Approach

The next step was to co-design appropriate ways of integrating the teaching and learning approaches developed in cycle 1. We established the context and purpose of the research by forming collaborative working relationships with teacher education institutions, first with the deans and rectors and then the teacher educators. Once this was done, we jointly constructed the issues, co-developed the plan of action, supported participants in taking action back at institutions (Change Project plan of action) and then evaluated this action (the implementation process) with an end of cycle workshop. This cycle was repeated two times, firstly with 27 institutions from 9 English-speaking countries, secondly with 15 institutions from six French and Portuguese speaking countries.

For the diagnosis we posed this research question, “How can we use ESD teaching and learning approaches to transform teacher education in ways that empower student teachers with essential competences for the 21st century and beyond?” The planning was organized in the form of cluster workshops at which there was dialogue

first with the deans and rectors (cycle 2a) and secondly with teacher educators (cycle 2b) which led to developing the Change Projects as action points for each institution. Colleagues from SADC REEP who played the role of critical friends evaluated the implementation of these "change projects" after 9 months. Cycle 2 is the main focus of this research as described in detail below.

SADC REEP and SWEDESD coordinated two workshops for leaders in teacher education in 2013 and 2014 for participating universities and colleges of education (Cycle 2a). These meetings mandated SWEDESD and SADC REEP to coordinate practical efforts of integrating ESD in their institutions. Two teacher educators from each institution were seconded as project managers for mainstreaming ESD in their institutions. This was then followed by Cycle 2b, during which five cluster workshops were conducted between 2013 and 2014 with teacher educators from 42 institutions as the first step in institutionalizing ESD into teacher education. Following the workshops the participants initiated "change projects" for testing and implementing ESD approaches into their institutions. One of these "change projects" will be discussed in detail as an example of unfolding impact. We had planned cycle 2, we had presented all the sessions, we had received Change Project reports and now it was time for us to complete the cycle by reflecting on what had happened. The analysis that follows is based on the following data sources; the "change project" reports, summative evaluation questionnaires completed by the "change project" leaders together with interviews by a critical friend from SADC REEP and an analysis of the "change project" reports together with the summative evaluations by the University of Botswana.

Figure 5 is a summary of the cyclical and collaborative research methodology showing the two elements of the "core action research cycle" and the "thesis action research cycle".

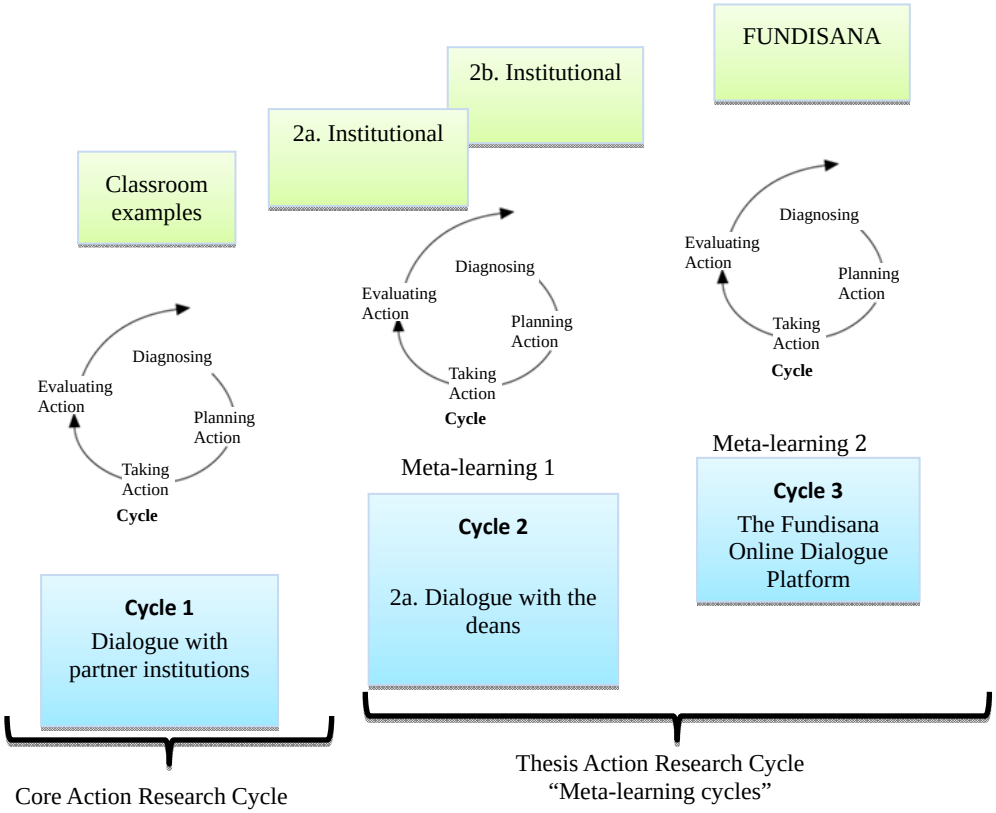


Figure 5 Action Research Learning Cycles Adapted from Coghlanand Brannick (2001)

Our results show that this was the best way for practitioners to integrate their actions of implementing change in their teacher education practice while at the same time developing an understanding of the effectiveness of this implementation in an iterative manner. It gave the practitioners an opportunity to participate in an ongoing testing and monitoring of transformational changes in their own practice. The on-going "change project" task has enabled practitioners to work in a collaborative way when identifying issues in their institutions, developed processes for improvement and in so doing provided them with alternative ways of viewing and approaching educational questions, opening a new way of examining their own practices.

5.4.3 Cycle 3: The Second "Meta-learning Cycle" — Fundisana Online

The critical analysis of the "change projects" conducted by the University of Botswana (Ketlhoilwe, Silo, & Boikhutso, 2014) revealed that 60% of the institutions were grappling with integrating ESD into their curriculum. Consultations between SWEDESD, SADC REEP and participating institutions showed that a wider community of teacher education institutions in the SADC region would benefit from and extension of the ESD project and the current model of cluster workshops will not meet this demand. Further discussions between SWEDESD and SADC REEP arrived at a decision to offer an online ESD course, Fundisana Online, to support current and future partner institutions in the desired integration process. This is an emerging demand driven cycle responding to needs analysis survey from conference dialogues with other SADC teacher education institutions, the SADC ESD community and the SADC Secretariat in charge of ESD. This diagnosis led to the question "How can the lessons learnt from the change projects in cycle 2 be replicated across a wider community of teacher educators?" The action that followed this plan was another dialogue with colleagues from 5 universities, one from Sweden and 4 from SADC; and an expert on online learning platforms, the YMP from Lund, Sweden. Cycle 3 is therefore a result of a critical analysis of the most pressing needs being addressed by the Change Projects. The online course will create possibilities for a faster and more effective way of mainstreaming ESD in teacher education with the potential to reach 100 teacher education institutions in the entire SADC region.

6. Findings and Examples of Outcomes and Challenges Encountered

We have on record some 42 ESD "change projects" in our partner institutions, of which impact results are emerging. Three evaluations have been carried out to show the unfolding impact, one by the University of Botswana (Ketlhoilwe, Silo & Boikhutso, 2014), one by a Master Student from Uppsala University (Schrage, 2015), and the on-going reflections by SWEDESD. Out of 42 "change projects", 17 are engaged in ESD processes that can be described as transformative teaching and learning which includes critical reflective thinking, creativity, collaborative decision-making, ethical awareness and commitment to personal and social action.

On the other hand, 25 "change projects" were addressing current sustainable development issues, which happen to be very important local challenges like reclaiming degraded land, initiating food gardens, water harvesting and waste management. Although the ESD programme managed to help participants to connect some practical work (agency) to their "change project", actual teaching and learning (for the 25 projects) change was observed to be superficial. Some critical areas of development were not being addressed in ways that develop essential competences for transforming society. Three areas were cited for continuing professional development. First, some projects do not say what it is that they want to change in teaching and learning. It seems easier to tackle sustainability issues like litter compared to what needs to be changed in the current education system in order to manage/reduce litter. Secondly, other projects did not address how the sustainable development projects

are being used as an opportunity for enhancing lessons or syllabus or curriculum. Also lacking was how some proposed change projects will permeate into other departments and to make national and regional connections with others doing or willing to do the same.

6.1 Case Implementation of "Change Project" in One Teacher Education Institution — Mauritius Institute of Education (MIE)

As an outcome of a cluster workshop MIE participants had a "take home" assignment, which aimed at implementing a "change project" in our respective workplace. The "change project" had to focus on the **quality and relevance of education** and proposals were made at 3 levels and they were as follows:

(1) At individual teaching level in our respective teaching sessions

(2) At department level by working through the syllabus or subject curriculum to include ESD issues

(3) At institution level across all relevant subject area departments

The MIE team adopted the 3rd level, that is, at the institution level. A meeting with the directorate was held to explain the "change project" and the support was obtained to implement the project. This step relates to the cycle 2a of the action research cycle. This step was the basis for the implementation of the "change project". The directorate issued a communication informing about the project and requesting staff to support and collaborate.

The cluster workshop consolidated and furthered knowledge and understanding of ESSA concepts among MIE staff and principles and their mainstreaming in teacher education programmes. Regular meetings were held to discuss the implementation of the "change project" and the following were adopted as the **implementation process**:

- Identification and approval of the selected teacher education programme (TEP) for implementing the "change project" at MIE
- Meeting with members of Programme Committee members of the selected TEP
- Meeting with the MIE Education for Sustainable Development Committee members
- Workshop with MIE staff on ESD
- Analysis of the "The Parts and the Whole" resource pack
- Implementation of the "change project" in the delivery of the selected programme using the "The Parts and the Whole" Resource

6.2 Identification and Selection of the TEP

The post graduate certificate in education (PGCE). This programme aims at providing secondary schools teachers with opportunities to acquire knowledge, skills and attitudes for the development of professional competences. This programme was selected as it was going to be subjected to a review process. The programme is managed by a programme committee (PC) comprising of members from each subject area department as shown in figure below:

- Business Education
- Computer Education
- Design and Technology
- English
- French
- Maths
- Science (Biology, Chemistry, Physics)

- Social Sciences (History/Geography and Sociology)
- Visual arts
- Education Studies
- Curriculum studies and evaluation

The 4 change agents at MIE were all members of the PC.

6.3 Meeting with PGCE Programme Committee Members

Members of the ESSA team had a meeting with the programme committee of PGCE. This meeting and all meetings with teacher educators relate to cycle 2b of the action research cycle.

The programme committee took note of the ESSA programme. The change project was presented to all members of the PC and discussion focused on the extent to which the change project could be implemented through the PGCE programme.

The programme committee submitted the reviewed programme to Teacher Education Committee for discussion and for onward submission to the Academic Board for validation and approval.

The outcome of the validation and integration of ESSA concepts through the change project in the PGCE programme is summarized in Table 1. ESD related concepts were included in subject didactics modules of some subject areas and were also offered as electives as shown in Table 1.

Table 1 Summary of ESD related Concepts Addressed in PGCE Programme

Subject Areas	Modules	ESD related concepts
Business Education	Subject didactics III	Production and operation management Environmental impact of travel and tourism development
Science Education	Subject Didactics I	The Environment Sustainable Living Science and Technology and their impact on society
Science Education	Subject Didactics II (Biology)	Photosynthesis Respiration Energy production system
Social Studies-	Subject Didactics III	Emerging contemporary social issues including: poverty, sustainable development, human rights
Visual Arts	Subject Didactics II	Innovative practices Eco-friendly approach in art making
Elective module 1	Citizenship Education	Aspects of a citizenship education Living in a multicultural society Inquiry- and project-based learning
Elective module 2	Education for sustainable development	History of ESD Principles of ESD Mainstreaming ESD in subject disciplines Mauritius: Sustainable Island Project (Maurice, Ile Durable)

Twenty elective modules are offered in this programme. Out of these, two modules, namely citizenship education (CE) and education for sustainable development (ESD) are ESD compliant and the content of these modules are highlighted in Table 1. Furthermore we see from the table that ESD related concepts are not addressed in Languages (English and French), though the academics from these departments did mention that they

covered such concepts in comprehension exercises.

Table 2 shows that since 2013 up to date 81 and 92 students have followed CE and the ESD modules respectively. Table 2 shows that since 2013 up to date 81 and 92 students have followed CE and ESD elective modules respectively.

Table 2 Number of Student Teachers Trained in ESD Related Modules

PGCE Cohorts	Elective Modules	No. of students/module
2013–2014	CE	17
	ESD	46
2014–2015	CE	34
	ESD	27
2015–2016	CE	30
	ESD	19

The 2 elective modules which are ESD related are citizenship education (CE) and education for sustainable development (ESD). These 2 modules aim at providing knowledge and understanding of the concepts related to CE and ESD. There were limited number of seats because of the limited resources made at the disposal of the teacher educators to deliver the modules. Student teachers came from diverse background; they are from Science, Business Education, Social Sciences, Languages (English, French and Asian languages). These student teachers enjoyed the modules as they were provided with practical examples of how to, in one hand value their learning areas from a sustainability perspective and in the other hand, they were engaged in project based learning aiming at integrating ESD in their respective subject areas.

6.4 Meeting with Education for Sustainable Development (ESD) Committee Members

The MIE has set up an ESD committee to coordinate all activities related to ESD. Three of the "Change Project" team members are also members of the ESD committee. A meeting was held with the ESD committee members. The meeting aimed at exploring ways of mainstreaming ESD in the PGCE programme. Some ESD committee, members were very confused or were not knowledgeable about ESD. They stated that…

> *"Perhaps what we are doing in our lecture sessions are related to ESD, but we do not know… What is ESD and what is not ESD?....).*

These questions indicated that if change project was to succeed, there was a need to provide capacity to academics at MIE on ESD. We thus decided to organize workshops for MIE staff and it was agreed to hold the first one in October 2013 for the MIE ESD committee members.

6.5 Workshop with MIE Academic Staff on ESD

The workshop has demonstrated that most of the staff have limited or inadequate knowledge and understanding of principles and philosophy. For them, ESD is about protecting the environment, prevention of pollution, waste… They were not aware of the decade for ESD and the GAP for ESD. They were not able to formulate that it's about re-orient educational policies including programmes for capacity building of all ESD practitioners including educators and teacher educators. Some teacher educators were of the opinion that ESD is meant for science and history/geography. They were not knowledgeable about the competences which are associated with ESD and the relevance for them in their respective subject areas, such as education studies, curriculum studies, maths. It was felt that academics at MIE should develop a new culture of teaching and

thinking in terms of programme development and delivery.

6.6 Analysis of the Resource "Parts and the Whole" and Selection of Activities

The ESSA team members met to analyze the resource "Parts and the Whole", an outcome of cycle 1 of the action research cycle, to identify and select the activities which could be used to support the delivery of topics in the modules potentially ESD compliant. Table 3 summarizes the outcome of this exercise.

Table 3 Activities Selected from the "The Parts and the Whole" Resource Pack

SN.	Activities from "The Parts and the Whole" Resource	Discipline where used
1	A Good Life	English, French, Social Studies and Visual Arts
2	Ecological Footprint	Science(Biology) and Social Studies
3	Ecological Footprint and Fairness	English and French
4	Cool News for a Hot Planet	Science (Physics)
5	Carbon Cycle	Science (Biology)
6	The Mystery of the Whole Garden	English
7	Bee Keeper Story	Social Studies (Geography)
8	The Happy Planet	Social Studies (Geography)
9	Cell Phones, Gorillas and Armed Conflicts	Business Education

The resource offers opportunities for merging theory and practice and transdisciplinary approaches – teaching across subject areas. Instead of presenting the concepts in the traditional way, the resource provided a different perspective of the content and concepts. The concepts were rather merged into themes which were contextualized in the socio-ecosystem. Bee keeper story, carbon cycle, the happy planet were examples of such contextualized themes from which concepts of the relevant subject areas emerged. Thus the themes provided an interface between context and concepts which was an enabler for transdisciplinary and helped to blur the frontiers between various subject areas.

Another component of the programme where the change project would be implemented was the professional practice seminar (PPS). These seminars comprise various themes including "My relationship with my subject area".

6.7 Implementation of the "Change Project" in the Delivery of the Selected Programme Using the "The Parts and the Whole" Resource

Not all the activities identified in Table 3 were implemented in the delivery of the programme. The only activities implemented in the semester of programme are given in table below.

SN.	Activities	Subject Area
1	A Good Life	Social Science (Sociology)
2	Ecological Footprint and Fairness	English and French
3	Carbon Cycle	Science (Biology)

These worksheets were distributed in the respective classes by the respective tutors. The tutors were given the corresponding teacher notes to support the implementation of the students' worksheets.

- Carbon cycle worksheet

This was implemented in a class of 12 students. The worksheet was useful as it did help to make the link with

broader issues such as global warming and climate change and was not limited to only understanding of respiration and photosynthesis concepts. The worksheet did elicit thinking among the students and its use in the session was appropriate. The timing to use the worksheet fitted well with the session.

However some constraints were also observed in the worksheet related to track 1 and track 5. What was the source for track 1 and what was the diagram representing in track 5? These were not clear and created some confusion.

- Eco-Footprint and Fairness' and "Good life" worksheets

The dialogue held with tutors revealed that the students responded quite well to the activities implemented in the class. Students were engaged in the activity all throughout the session. In the French class it was a small group discussion with answers being re-written and re-considered. During the plenary session the tutor noted that the idea of sustainability being infused throughout students' presentations.

These worksheets were also used in an English Language. The session was a student-led discussion where the students discussed alternative ways of teaching this topic. They also reconsidered the idea whether it could be incorporated within a language class. "The Good life worksheets could be sued following a comprehension or a debate session in a upper secondary English Language class."

The discussion on the above worksheets enabled the student teachers to be actively engaged and interactive.

- Cell Phones, Gorillas and Armed Conflict worksheet

This worksheet was implemented in a Business Studies class. The students filled in the activity sheet but the tutor felt that there was a gap in the understanding of the concept on the part of the students. This view of the tutor stems out from the discussion held in the class after the activity sheet was filled in by the trainees.

- "A Good Life" worksheet

This worksheet was used in a business studies class. The session started with an individual reflection about what does a 'good life' meant to the students and ended with a group activity where they were engaged throughout. The overall reflection about this activity is that all the students found the activity very enriching. The students were asked to relate their discussion to the Marxist perspectives but also to relate these sociological principles to principles of sustainability which were introduced to them in a previous class. All the students were able to participate actively and express themselves. The outcome was sharing of ideas, feelings and a very enriching discussion about how the meaning of "a good life" may vary from one individual to another. At the end all the trainees agreed that social change may lead to unsustainable conditions and that it is only by adopting good practice that we will be able to minimize our ecological footprint and move towards sustainability.

- The PPS

With respect to the PPS where discussion related to the trainee's relationship with his/her subject area, the following questions which were prescribed in PGCE FT programme appeared to be appropriate to drive the discussion on relating subject discipline to a wider context (here it is ESD).

These questions include:

(1) How does my subject inspire me?

(2) How do I keep abreast with development in my field?

(3) What would it mean to be able to teach my subject?

(4) Where is my subject area situated in the broad scheme of knowledge?

Three groups of PPS were conducted in parallel. Team teaching was the approach adopted whereby 2–3 tutors led the PPS in each group and the students were from 2–3 subject areas in each group.

- What came out of this PPS?

The students were not able to relate their subject in a broader perspective. After displaying a power-point slide where the overarching goals of the national curriculum framework were displayed, students started to come up with multi/trans and interdisciplinary ideas. They also made connections between their subject and gender, for example, how gender influence the choice of their respective subjects.

7. Discussion

At the very outset this paper seeks to explore possibilities of mainstreaming ESD in teacher education programmes of some selected teacher education institutions of SADC countries of southern Africa. The challenges, which the world is facing, are even more significant in this region due to the vulnerable social, economic and political situations. We have also argued that fertile ground in terms networks among the teacher education institutions and universities would be an enabling factor for the implementation of the change projects. The main aim was to enable a paradigm shift from infusing or greening the teacher education programme to a more effective mainstreaming of ESD in same. The discussion, which flows, will provide insights on the extent to which these mainstreaming processes are being realized. The discussion will resolve around the three research question formulated in the previous section.

- How can we prepare teacher educators and teachers with professional competences that meet the local and global challenges of the 21st century and beyond?

In the first instant teacher educators involved in the implementation of the change projects have demonstrated knowledge and understanding of ESD concepts and practices. They had a significant role in the implementation of the change projects in their respective institutions and as such had been the main “change agents” in this project. Besides the institutional commitment and will, the dedication though the competences acquired by these selected teacher educators as change agents was one of the enabling factors. Thus the preparation of teacher educators and educators with professional competences that meet the global and local challenges of the 21st century should be led by ESD change agents who will thus drive the mainstreaming of ESD in the respective teacher education programmes. At the MIE for example the programme directors/coordinators or programme committee was a determining instance for that purpose. If the ESSA programme through the meeting with deans of universities and directors (learning cycle 2 of the project) of teacher education institutions has obtained their unfailing support in the implementation of same, yet a strong national/institutional policy seems to be more than necessary for the sustainability of the momentum gained during the implementation of the change projects. As reported by Ketlhoilwe (2007), policies can either enable or constrain innovation in sustainability education, hence the need for critical thinking since many environmental policies enacted by SADC focus on exploitation of natural resources for development where environmental impact “takes lesser importance in the policy decision makers than the financial gains.

- To what extent teacher education institutions are empowered to adopt teaching and learning approaches that develop competences to meet the local and global challenges of the 21st century and beyond?

The engagement of teacher educators in the change project enabled them to rethink their respective teaching practices in the one hand, but it also provided insights into re-orienting their subject disciplines to make them more relevant and to have more sense making. This study, through the change projects, has not been able to fully mainstream ESD in the teaching and learning practices in the various contexts. In some it has initiated

"infusion/integration" of sustainability concepts and issues while in others it has put in place mechanisms and platforms for discussing and sharing of mainstreaming ESD concepts in teacher education programmes. The change projects have inspired teacher educators towards reflective practice and the action research was an appropriate methodology to enable this to happen. We have seen that alternative forms of teaching such as in the PPS where team teaching was adopted with trainees from various subject disciplines. These alternative forms have helped develop capacities and qualities in teacher educators which need to be displayed in order to meet the challenges of sustainability (Wals, 2010). This study has to some extent made some changes (to a varying degree with respect to varying contexts) in the way teacher education programmes are developed and delivered, it has not led to a transformational change. It is rather stayed at a transitional change. A systematic review and reformulation of the teacher education curriculum has been started, based on a deep and strong understanding of ESD and its practical implications. It is essential for teacher educators in their teaching and learning contexts to connect and work with environmental and sustainability education policy using critical thinking skills and progressive lenses. Although there was no evidence that the gains made were transferred into the schools the teacher educators displayed and reported an increase in reflection during the project and immediately after it. The challenge is on sustaining and scaling the competences they have mastered during the training.

Subject discipline at the frontline but yet it has initiated among teacher educators rethinking of the TE programme, its relevance and quality for addressing sustainable development goals, including the SDG 4 and promoting 21st century competences.

- What are the opportunities and challenges which teachers would face to mobilize these competences and why?

The change project has certainly created an awareness within the respective institutions about rethinking their respective teacher education programmes to make them more sustainability compliant. These institutions have also created new or reinforced existing instances for teacher education programme development and their delivery. The study has shown that though there is an inadequate knowledge and understanding of concepts related to sustainability issues, but yet the ESSA project/change project has also created an awareness of the ESD among teacher educators as a driver for scaling/valuing programme development and programme review and thus initiating a momentum for "change". The project through its various discussions with staff in meetings has initiated an understanding of the concepts related to sustainability and its mainstreaming in programme development for teachers. Some members have been exposed to mainstream concepts from the "parts and the whole" into their respective practices and gained experiences in team teaching and sharing of expertise. This created a different landscape of teacher education though a low scale.

The main challenge faced in implementing the change projects remain the extent to which teacher educators are knowledgeable about sustainability. The challenge also resides with their inadequate experience in programme development and to a larger extent mainstreaming sustainability concepts in programmes for teacher education.

The other pertinent challenge relates to assessment practices within each module. The assessment modes are either continuous assessment or written examinations. Thus, these modes do not show compatibility with the reviewed and ESD-complaint modules. Thus the evaluation policies at teacher education institutions should be reviewed to rationalize and harmonize the assessment practices. Despite the limitation cited above, we can claim through this research and collaborative evaluation that in at least 17 teacher education institutions;

- ESD had been effectively included in the institution's strategic documents;
- Sustainability issues have been included in the curriculum;

- Management, teachers educators and teacher students have arrived at a common vision on sustainability and ESD in their respective context;
- A sustainability community of student teachers and teacher educators has emerge and is active in taking sustainability-related initiatives throughout the institution.

8. Conclusion

We have on record some 42 ESD change projects in our partner institutions, of which impact results are emerging. Three evaluations have been carried out to show the unfolding impact, one by the University of Botswana (Ketlhoilwe, Silo & Boikhutso, 2014), one by a Master Student from Uppsala University (Schrage, 2015), and the on-going reflections by SWEDESD. Out of 42 Change projects, 17 are engaged in ESD processes that can be described as transformative teaching and learning which includes critical reflective thinking, creativity, collaborative decision-making, ethical awareness and commitment to personal and social action.

On the other hand, 25 Change Projects were addressing current sustainable development issues, which happen to be very important local challenges like reclaiming degraded land, initiating food gardens, water harvesting and waste management. Although the ESD programme managed to help participants to connect some practical work (agency) to their change project, actual teaching and learning (for the 25 projects) was observed to be superficial. Some critical areas of development were not being addressed in ways that develop essential competences for transforming society. Three areas were cited for continuing professional development. First, some projects do not say what it is that they want to change in teaching and learning. It seems easier to tackle sustainability issues like litter compared to what needs to be changed in the current education system in order to manage/reduce litter. Secondly, other projects did not address how the sustainable development projects are being used as an opportunity for enhancing lessons or syllabus or curriculum. Also lacking was how some proposed change projects will permeate into other departments and to make national and regional connections with others doing or willing to do the same.

In conclusion we can argue that the Change Project Approach can be used to initiate changes that empower children in Southern Africa, like elsewhere in the world, with a kind of education that empowers them to play a pivotal role in the trajectory of the continent, an education model that cannot be business as usual. The Change Project Approach can open new opportunities that will yield significant benefits for both African young people and society as a whole; better employment opportunities and job prospects, improved quality of life and greater economic growth. There is a need for a paradigm shift in our educational models in Southern Africa and the Change Project Approach is one way of making this happen.

Although the project has forced teacher educators to re-think the different ways of preparing “the teacher we want” in the 21st century, the issue of national examinations still remains a major challenge. In southern Africa the quality of schools and their teachers is measured by how they are able to pass students through national examinations. The increase in percentage pass at national examinations is used at criteria by national government for budget allocation to education department under the project base budgeting policy thereby putting more pressure on the system for exams-oriented education system. Unfortunately most national examinations do not offer alternative assessment methods that test for critical thinking, creativity, communication and collaboration, essential competences for our rapidly changing world.

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