

Journal of Teacher Education for Sustainability,
vol. 12, no. 2, pp. 17–26, 2010

DEVELOPING AND APPLYING A CRITICAL AND TRANSFORMATIVE MODEL TO ADDRESS EDUCATION FOR SUSTAINABLE DEVELOPMENT IN TEACHER EDUCATION

Nelly Kostoulas-Makrakis
University of Crete, Greece

Abstract

A reflective case study approach, including focus interviews, reflective/reflexive journals and analysis of project-based works of 30 pre-service teachers participating in an undergraduate course was employed to investigate the discrepancy between the teachers' constructivist conceptions and the actual practice. The identified discrepancy seemed to be an outcome of the difficulty in translating constructivism into teaching practice, but also of the misleading conception of constructivism as a homogeneous philosophy. Through reflective practice, the participants were able to deconstruct and reconstruct their theories and practices of teaching in more emancipatory ways addressing issues of education for sustainable development. The present case study helps understand the nature of change process towards teaching and learning for more sustainable future.

Key words: education for sustainable development, teacher education, transformative learning, action research, teaching methodology

Background

Two of the major forces shaping and driving education in the last two decades are: 1) the shift from instructivism to constructivism and 2) the quest for re-orienting teacher education for sustainability. UNESCO (2005), as the lead agency spearheading the United Nations Decade of Education for Sustainable Development (2005–2014) defines Education for Sustainable Development (ESD) as the promotion of values and ethics through education at different levels to make an impact on people's lifestyles and behaviours and help build a sustainable future. ESD is more than just environmental education; it encompasses values and attitudinal changes, as well as environmental, economic and socio-cultural perspectives. However, discourse over the meaning of sustainability uncovers its complexity, multidimensionality and contextual relevance. Two contrasting meanings often debated refer to mainstream and radical paradigms (Webster, 2001, as cited in Huckle, 2006). The dominant or mainstream meaning of the term represents a reformist orientation and seeks to balance economic growth with social welfare and environmental protection. It

obscures the need to develop the economy or society within ecological limits and fosters reductionist rather than holistic or systemic thinking. The radical view in contrast generates economic welfare and social justice within ecological limits. Although these two paradigms simplify the complex, multidimensional and contextual relevance surrounding debates on sustainable development, they do help to see the different pedagogical perspectives underpinned by each one. The radical view of sustainable development asks for an education that integrates reflective, systemic, emancipatory constructivist and critical transformative thinking, while the reformist view is being framed within the instructivist and moderate constructivist pedagogy (Figure 1).

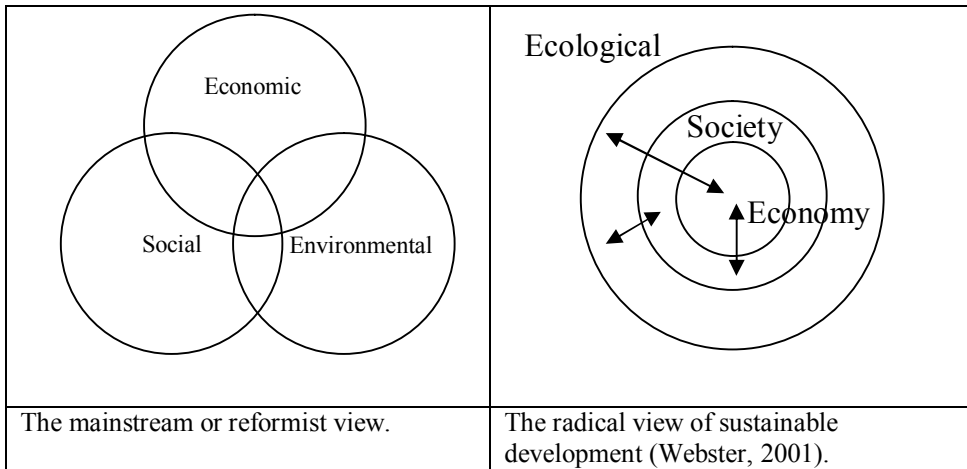


Figure 1. The reformist and radical view of sustainable development

A re-orientation of teaching and learning practices towards transformative pedagogy is often called as the most needed to make an impact on people's lifestyles and behaviours and help build a sustainable future (Sterling, 2001). Transformative and critical constructivist learning inherent in radical views of sustainable education is a shift of consciousness that can change one's unsustainable way of thinking, being and acting. Such a shift involves an understanding of one's self in the world; of relationships with other humans and the natural world; of the relations of power; of alternative approaches to living; and of the possibilities for social justice, peace and personal joy (O'Sullivan, 2003). A critical constructivist perspective of learning incorporates not only the notion of "social negotiation" which "recognises that learners learn by challenging their thoughts, beliefs, perceptions and existing knowledge through interacting with other learners and with the course presenters" (Hedberg, 2003, p. 176), but also an emancipatory conception of knowledge construction (Makrakis, 2004). In teaching and learning, the critical and emancipatory conception of knowledge construction underlies reflexive and reflective practice. "Reflexivity involves more than reflection on one's own practice; it also involves reflecting on the broader context of that practice, and it's shaping influences, asking questions such as "Where are we going? What lies behind our understanding that this is the

way to go?” (Rosenberg, 2005, p. 106). It is a very powerful and useful principle that we should apply most of the time to the way we teach. Such a kind of transformative teaching practice is less evident in schools. Thus, it is critical to find out pedagogical frameworks to integrate curriculum, teaching and learning in ways that promote a radical view of ESD. Curricula are also usually decontextualised, focusing on knowledge without a “real life” meaning to students (Makrakis & Kostoulas-Makrakis, 2005). These discrepancies seem to be not only an outcome of the difficulty translating constructivism in curriculum development and teaching practice, but also of the misleading conception of constructivism as a homogeneous philosophy (Dancy & Henderson, 2007; Barak & Shakhman, 2008).

The view that constructivism is synonymous with approaches to teaching that are learner-centred based on the utilisation of previous knowledge is misleading. Constructivism may take many forms, even within one type. Broadly, constructivist pedagogy reflects two schools of thought: the one based on the principles of neo-positivist and interpretive pedagogy and the other on critical and emancipatory pedagogy. Emancipatory constructivism is best seen as a reaction to positivistic and interpretative conceptions of knowledge construction. Such an orientation merges knowledge with transformative action, which is highly needed for learning-based change, which in turn is considered essential of reorienting curricula and teaching methods to education for sustainability. It is time to explore across disciplines, sectors and cultures, seeking other models that might help us to engage in deep change towards sustainability (Wheeler, 2007). There is also a continuing pressure for curriculum changes involving broad-scale, cross-disciplinary reorganization to facilitate education for sustainability (Fien, 2002a, 2002b; Fien, 2003; Tilbury & Wortman, 2004). This article presents a case study that aims to enhance pre-service teachers learning through the introduction of ESD teaching methods in an under-graduate level teaching methods course and attempts to answer the following questions.

How can we enable teachers to experience emancipatory education for sustainability knowledge construction? In other words, how can we enable teachers to deconstruct and reconstruct their personal theories and practices of teaching in more emancipatory ways? How can we construct a pedagogical environment in which teachers can experience the power of constructing critical knowledge addressing issues of education for sustainability?

Methodology

Research on teacher education over the last two decades reflects a growing focus on reflective teaching (and reflective teacher education) as opposed to a tradition of technical rationality. Despite the diversity of approaches to teacher reflection, teaching and learning can be thought of as “reflective conversation with the situation” and school is assigned a transformative role in society (Schön, 1987). Teachers and learners are supposed to develop an attitude of inquiry-based learning and a holistic view of how learning activities can be organized to advance learning for sustainability (ibid.). A reflective case study approach based on action research methodology was employed using focus interviews, reflective/reflexive journals and analysis of project-based works (Table 1). In this study, 30

pre-service teachers took part in the context of an undergraduate course entitled “Teaching methodology and education for sustainable development” offered in the Department of Primary Education, University of Crete during the academic year 2008/2009.

Table 1. Data collection and analysis framework

Method	Aim	Process	Categorisation and analysis
Participant observation	The aim was to uncover factors important for a thorough understanding of education for sustainability.	Throughout the action, research intervention, the instructor was taking notes on how participants responded to the activities.	The observations, recorded as field notes, were used to triangulate our findings about the impact of the intervention on shifting paradigm regarding personal theories and didactic approaches.
Focus groups	The aim of the focus groups was to gauge the pre-service changes as a result of the intervention. The focus interviews also sought feedback on the teaching intervention for formative assessment.	It started with asking participants to discuss what education is for and define what learning is and how they perceive instructional design, as well as articulating their beliefs, values and practices.	Data from this process was collected using written statements by the participants in the course and field notes taken by the instructor. The categorised data was analysed for key themes related to the changes they considered happening as a result of the intervention.
Reflective journals	The aim was to encourage participants to think and critique their personal theories and practices.	Each participant in the course maintained a journal during the project work to capture their learning journey.	Journals were described in their personal assignments. Data was analysed to provide insights into the changes occurring as a result of the intervention.
Project works	The aim here was to develop projects dealing with sustainability issues applying new knowledge and practices.	The project works were carried out in groups of two or three utilising various resources.	The content of the project works was analysed, searching for categories that revealed or described the transformations into the desired outcomes and pedagogies.

The main framework of the action research process, as depicted in Figure 2, consisted of four interactive stages: 1) getting started (reflection, activation, problem identification and problematisation, disorienting dilemma); 2) de(re)construction (reflection, reformulation, reassessment); 3) getting involved (reflection, knowledge construction, transformation); 4) learning-based change (learning by action, change). Following a radical sustainability perspective, the person is viewed as an active agent in a change process. In this process, participants were engaged in discourse and critical self-reflection, using some activating events and disorienting dilemmas, through which they come to critically examine their personal views, teaching practices and learning theories, open themselves to alternative views and practices and consequently drive them to change the way they view

curriculum, teaching and learning. According to Mezirow (2000), it often follows some variation of a number of phases, such as: 1) a disorienting dilemma; 2) self-examination with feelings of fear, anger, guilt, shame; 3) a critical assessment of assumptions; 4) recognition that one's discontent and the process of transformation are shared; 5) exploration of options for new roles, relationships and actions. As Cranton (2000) suggests, this kind of transformative learning is recursive: individuals must first think about change and see the purpose for change before change occurs.

Disorienting dilemmas evoke every conceivable emotion in learners. Our emotions and our feelings provide both the impetus for us to critically reflect and the gist of which to reflect deeply (Taylor, 2000). Examining their perspectives is one way people are able to transform their paradigms and practices and, as a consequence, grow professionally (Henderson & Hawthorne, 2000; Murphy, 1999). Transformative learning is a shift of consciousness that can dramatically and permanently alter one's way of being in the world. Such a shift involves an understanding of one's self; of relationships with other humans and the natural world; of the relations of power in interlocking structures of class, race and gender; of body awareness; of alternative approaches to living; of the possibilities for social justice, peace and personal joy (O'Sullivan, 2003).

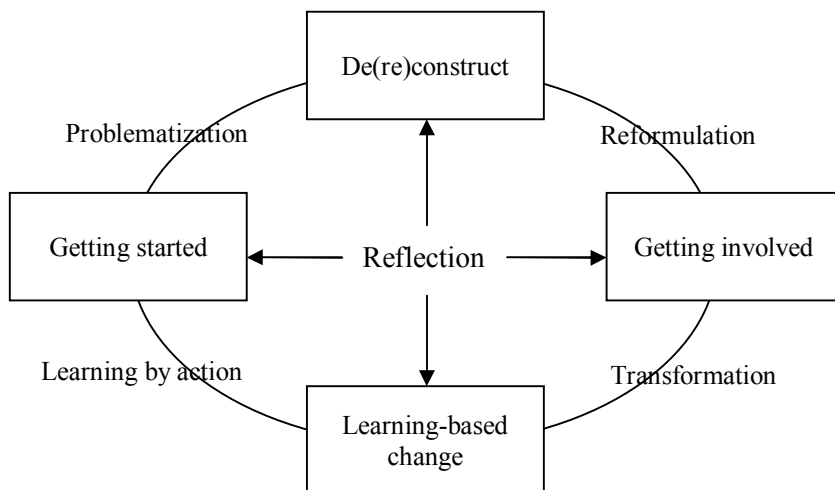


Figure 2. A methodological approach to infuse a radical view to education for sustainability

Implementing the critical reflective and transformative model

The participants were first challenged to discuss the questions: *What is education for?* and *What is teacher education for?* These questions stirred discussion and helped the group to reflect on their assumed beliefs and practices. Content analysis revealed that the prevailing beliefs were associated with a kind of instrumentalism that was largely expressed in views that “education is for preparing learners to meet the society’s demands”. When it comes to teacher education, instrumentalism was associated with the increased employment

prospects of the teaching profession in Greece, which has placed teacher education among the three most demanded academic fields (medicine, engineering and pedagogy). Whilst these are clearly important, there was a need to reverse participants' instrumental views by asking the group to question what such an education is leading to from a sustainability perspective. In fact, there was an attempt to create a sense of dissatisfaction with regard to participants' prevailing instrumental views regarding education that are contradictory to education for sustainability.

The preparatory process paved the way to the de(re)construction stage, defined as a process to demonstrate that pre-service teachers' personal theories in teaching and learning, beliefs and knowledge are not discrete wholes. They contain several irreconcilable and contradictory meanings. To empower pre-service teachers in the constructing process, a heuristic devise in the form of a table with two columns termed sustainability in the growth mode (reformist view) and sustainability in the development mode (radical view), based on Huckle and Martin's (2001) assumptions on these two polar modes was introduced. If a group of participants held values that were eco-centric and weakly anthropocentric (strong sustainability), they advocated the inextricable dependence and well-being of human and non-human nature and that knowledge is constructed, rather than being "found" out there in the world. If a group of participants believed that sustainability can be realised along with continued capital accumulation or economic growth (weak sustainability) without requiring a radical restructuring of current socio-economic social relations, they advocated more instrumental conceptions of teaching, learning and curriculum. The large majority of participants exhibited views related more to the reformist polar mode rather than to the radical one. This was consistent with their views concerning "deep" and "surface" learning. By posing a number of questions reflecting these two learning approaches, it was revealed that while the large majority of participants viewed learning as a process of knowledge construction on the basis of previous experiences, their instructional design views tended to reflect a linear rather than a constructivist model. There was an attempt to decentre their instructivist approaches by challenging the identified contradiction and to help them consider carefully the reasoning behind such a contradiction.

This was tackled by asking the questions: *How is a linear (surface learning) conception of teaching related to weak sustainability?* and *How is a constructivist (deep learning) conception of teaching related to strong sustainability?* This type of problematisation was used as the means of empowering pre-service teachers moving away from instructivist conceptions of teaching and learning for sustainability to more constructivist and ultimately transformative approaches that make learning motivating, engaging and situated in authentic contexts. In an attempt to enlighten participants' understanding of the two modes of sustainability in relation to teaching and learning, the researchers discussed three different types of curriculum: 1) transmission or technical (curriculum as a product); 2) transactional or practical (curriculum as a process); 3) emancipatory or transformational (curriculum as praxis), following Grundy's (1987) typology. This heuristic devise reinforced the de(re)construction of instrumentally-held and instructivist beliefs that were elicited at the starting phase. Through this process and the enlightenment provided through readings and discussions, a paradigm shift was occurring,

moving pre-service teachers towards a better understanding of their role as change agents. The following quotations reveal student-teachers reconstructions.

The role of education is more complex than I have thought before this intervention and more critical for the development of conscious and active future citizens. I have heard of the need to transform students into active citizens several times, but never of how to achieve it.

In a considerable number of learning-based change statements, participants revealed that this discrepancy was changed largely due to the methodological approach implemented in the course and the values inherent in the concept of education for sustainability. The statements like the following give support to this assumption: “I realised that the role of education is to connect school with society and its problems”. “Education should give children the skills that are necessary in order to undertake social action, to recognise problems and issues and to be able to work with others”. “The aim of education is to create capable, responsible and conscious citizens that fight for social justice”.

By means of the above activities, the participants reached the expected level to start merging transformative learning strategies in designing lesson plans dealing with sustainability issues. In getting involved, working in groups of two to three, the participants were engaged in the development of 12 lesson plans dealing with a variety of sustainability issues, such as hunger, poverty, children’s rights, AIDS/HIV and environmental depletion. To facilitate this process, the participants were introduced to a number of writings elaborating the social, cultural, environmental and economic dimensions of sustainability and the possible sustainability issues that may arise in each of these dimensions. These problems reflect the complexity of real world problems. They are also relevant to the pre-service teachers’ situations. In addition, they require them to explore open education resources and to draw on knowledge from various subject areas, such as mathematics, geography and science. During the inquiry process, the participants went through to develop solutions, they communicated information, expressed opinions and negotiated with the instructor. The analysis of participants’ dialogues and inputs from the developed lesson plans can be interpreted in the following summarised points: 1) they enjoyed acquiring new knowledge and experience in tackling sustainability issues from a transformative learning perspective; 2) they had taken responsibility and control of their learning and became actively involved in managing their learning process; 3) they were more motivated to take risks and initiatives in discovery learning and active citizenship; 4) they integrated social, environmental, cultural, ethical and economic sustainability conceptions in lesson planning; 5) they recognised the value of ecological modernisation, the role of human agency and reflective learning in empowering learners for sustainability knowledge construction. Given the space limitation and focus of this paper, a summary of the impact of the action research intervention to transform pre-service teachers’ instructivist conceptions of teaching and learning to methods that are more conducive to teaching and learning for sustainability is provided in Table 2.

Table 2. An overview of pre-service teachers changes as a result of the critical transformative model

Categories	Indicators of change	
	Before	After
Learning definitions	Focus on constructivist definitions	A shift to more critical constructivist definitions
Instructional design	Linear	Interactive
Instructional strategy	Fostering mostly lower-order thinking	Fostering mostly higher-order thinking
Making use of open education resources	Limited	Extensive
Systems thinking	View phenomena mostly from one side and focus on unrelated parts.	Understand interconnections and make complex choices.
Articulation	A limited possibility to articulate their personal theories and teaching practices	Realise that through exposing own beliefs and practices and reflecting on them it is possible to become better teachers
Self-directed learning	More dependent on what instructor asked	Monitor their own understanding and learning needs
Need for change	Seldom felt the need to change conceptions	Exercised a conceptual change as a need.
Collaborative knowledge construction	Less experienced	More opportunities for meaningful learning
Relevance	Mostly perceived learning in terms of completing the course	Connected learning to personal interest and relevance to sustainability

Concluding remarks

As it is evidenced, the adopted action research framework developed for this case study aims at transforming thinking and action towards sustainability. It encouraged the participants to look back and question assumptions about their teaching practices and personal theories and: 1) understand reflection as an integral part of the teaching and learning process; 2) evaluate and make decisions leading to learning-based change; 3) create conditions for systems thinking when dealing with sustainability issues; 4) be aware of the interrelations between the social, cultural, environmental and economic dimensions of sustainable development; 5) frame local sustainability problems as a part of a global context; 6) create conditions for critical thinking and reasoning when dealing with sustainability issues.

Pre-service teachers by the great majority exhibited constructivist conceptions in their personal theories, but confusion was evidenced in its translation into practice. The identified discrepancy seemed to be an outcome of the misleading conception of constructivism as homogeneous and lack of opportunities in merging theory with praxis. Through reflective practice and action research interventions, pre-service teachers were able to deconstruct and reconstruct their personal theories and practices of teaching in more emancipatory ways addressing sustainability issues. All of sustainability action research

contributions developed collaboratively by the participants have been framed within the paradigm of transformative learning.

This case study also helped participating pre-service teachers identify the multidimensionality of teaching and learning and understand the nature of change process towards teaching and learning for more sustainable futures. There was a strong consensus that critical constructivist learning and action research were important to the successful infusion of education for sustainability into teaching and learning. In general, this intervention introduced a range of associated changes to educational theory and practice, such as inquiry and problem-based methods, critical learning opportunities through debates and group work and opportunities for empowering pre-service teachers to shift from instructivist to sustainability knowledge construction and transformative pedagogy in lesson planning.

References:

- Barak, M., & Shakhman, L. (2008). Reform-based science teaching: Teachers' instructional practices and conceptions. *Eurasia Journal of Mathematics, Science & Technology Education*, 4(1), 11–20.
- Cranton, P. (2000). Individuation and authenticity in transformative learning. *Paper presented at the Third International Conference on Transformative Learning*, New York.
- Dancy, M., & Henderson, C. (2007). A framework for articulating instructional practices and conceptions. *Physical Review Special Topics: Physics Education Research*, 3(1), 010103.
- Fien, J. (2003). Towards the UN Decade: Looking backwards, looking forward. *The Development Education Journal*, 9(3), 3–5.
- Fien, J. (2002a). Education and sustainability: Reorienting Australian schools for a sustainable future. *Tela Papers*, No. 8. Melbourne: Australian Conservation Foundation.
- Fien, J. (2002b). Advancing sustainability in higher education: Issues and opportunities for research. *Higher Education Policy*, 15(2), 143–152.
- Grundy, S. (1987). *Curriculum product or praxis*. Deakin studies in education series. Abingdom: Reutledge Falmer.
- Hedberg, J. G. (2003). Ensuring quality e-learning: Creating engaging tasks. *Educational Media International*, 40(3/4), 175–186.
- Henderson, J. G., & Hawthorne, R. D. (2000). *Transformative curriculum leadership* (2nd ed.). NJ: Prentice Hall.
- Huckle, J. (2006). *Education for sustainable development: A briefing paper for the training and development agency for schools*. Retrieved June 16, 2006, from <http://www.trrb.ac.uk/Browse2.aspx?anchorId=14633&selectedId=14634>
- Huckle, J., & Martin, A. (2001). *Environments in a changing world*. Harlow: Prentice Hall.
- Makrakis, V. (2004). Didactics of information and communication technologies (ICT): From instrumental reason and conformity to emancipation and change. In M.

- Georgiadis et al. (Eds.), *Information and communication technologies in education. Proceedings of the 4th Panhellenic Congress* (pp. 526–531). University of Athens.
- Makrakis, V., & Kostoulas-Makrakis, N. (2005). Techno-sciences and mathematics: Vehicles for a sustainable future and global understanding. In *Proceedings of the 2nd International Conference on Hands-on Science, HSci, 2005* (pp. 103–108). Crete: University of Crete.
- Mezirow, J., & Associates. (2000). *Learning as transformation: Critical perspectives on a theory in progress*. San Francisco, CA: Jossey-Bass.
- Murphy, B. K. (1999). *Transforming ourselves, transforming the world*. NY: Zed Books.
- Rosenberg, E. (2005). *SADC regional environmental education programme evaluation*. Howick: SADC REEP/Share-Net.
- O’Sullivan, E. (2003). Sustainability and transformative educational vision. In P. Corcoran & A. Wals (Eds.), *Higher education and the challenge of sustainability* (pp. 163–180). Dordrecht: Kluwer Academic Publishers.
- Schön, D. (1987). *Educating the reflective practitioner*. San Francisco: Jossey-Bass Publishers.
- Sterling, S. (2001). *Sustainable education: Re-visioning learning and change*. Schumacher Briefing No. 6. Devon: Green Books.
- Taylor, E. (2000). Analyzing research on transformative learning. In J. Mezirow (Ed.), *Learning as transformation: Critical perspectives on a theory in progress* (pp. 285–328). San Francisco, CA: Jossey-Bass.
- Tilbury, D., & Wortman, D. (2004). *Engaging people in sustainability, commission on education and communication*. Gland, Switzerland and Cambridge, UK: IUCN.
- UNESCO. (2005). *The United Nations Decade of Education for Sustainable Development: International implementation scheme*. Retrieved October 25, 2005, from www.unesco.org
- Wheeler, K. (2007). Learning for deep change. *Journal of Education for Sustainable Development*, 1(1), 45–50.

Correspondence:

Nelly Kostoulas-Makrakis, Ph.D, Department of Primary Education, Faculty of Education, University of Crete, University Campus, Gallos, 74100 Rethymnon, Crete, Greece. Email: nkostoula@edc.uoc.gr