Commodity value chain analysis as a sustainability education process: Case studies from South Africa and Sweden.

Authors

1. Eureta Rosenberg, Rhodes University Environmental Learning Research Centre, South Africa
2. Åsa Westermark, Dept of Subject Didactics and Global Studies, Jonköping University, Sweden
3. Presha Ramsarup, Wits University Centre for Researching Education and Labour, South Africa

Correspondence to: Prof Eureta Rosenberg, E.Rosenberg@ru.ac.za

Key Words: Higher education; sustainability education; transformative teaching methodology; commodity value chain analysis; sustainable production & consumption

Introduction – the Problem Statement

At the time of writing this paper, young people are marching for action against climate change, and Mozambique, Zimbabwe and Malawi are facing the unprecedented devastation caused by extreme weather events. The Comparative and International Education Society, in describing the theme of its 2019 Conference focused on Education for Sustainability, notes that "*all hands are needed*". Indeed. If globally and as regions we are to achieve ecological integrity and well-being for all, widespread and profound changes are needed in homes, workplaces and government, to name a few sites of change where "all hands are needed".

Educational institutions have a key role to play. But while we have achieved much, in some ways our educational efforts still fall short of the depth and scope of transformation that is required to achieve sustainability goals. Why?

One reason, in our view, is that sustainability education (SE) activities are sometimes focused exclusively on the behavior of individuals, while not only individual behavior, but entire social, cultural and economic systems need to fundamentally change. Secondly, we have become excellent at raising awareness, and at communicating about environmental disasters and risks. But what follows after awareness-raising? What do the educated do, once they are aware of sustainability issues? Without a sense of how to move from awareness to action, without the means to address the problem, learners can become despondent, cynical or simply bored.

Thirdly, the necessary actions to address sustainability challenges, are often not obvious, and links between individual and systems change are poorly understood. Individuals could switch off the lights at home, while at a national scale, fossil fuels are burned to keep other lights on at maximum capacity. Educators educate individuals. How do these individual's actions relate to system change? Who should be educated? And how? Finally, how exactly do we address *both* ecological and developmental issues, when they so often seem to be conflicting interests requiring unequal trade-offs? When we do manage to bring industry, government and communities all around the table to discuss sustainability issues, we often find conflicting values and mindsets preventing progress towards solutions.

This is particularly the case in the international development arena. While nation states in the Global North are moving away from polluting industries, the financial wealth to which they have access, partly built on the exploitation of human and natural resources located elsewhere, does not in equal

measure exist in the Global South, to resource a just transition to clean, green economies. Furthermore, many governments in the Global South are of a view that they need to 'catch up' with the rest of the world by following the same industrialization model. It is an assumption that suits those 'developed' countries who need to relocate polluting processes and their waste products, that are no longer acceptable to the citizens of the Global North. If we are to achieve sustainability on a global scale, old modes of production and consumption must be disrupted, and such changes may come at a cost, particularly to those in comfort and power.

How do we teach SE, if it has to engage such challenges? In this presentation and paper we share a teaching and learning activity in which we see much potential for SE. It can address individual behavior but also structural or systems change; it raises awareness but also moves beyond awareness raising; and helps learners reconcile environmental protection with development needs in complex, conflicted situations. We have gained experience using this educational method in a variety of contexts in South Africa and Sweden, where we conduct research and offer courses for local and international students, with a local and international focus. Independently, on different sides of the globe, we have come up with a quite similar educational method. This teaching method involves students mapping, analyzing and expanding commodity value chains.

The paper describes how we have used commodity value chain analysis as an ES activity in two university programmes for education students. We share the actual outcomes and reflect on potential value of the activity, based on students' feedback (South Africa) and assessment of their assignments (Sweden). We highlight its educational value in relation to the limitations of behavior change or awareness-raising approaches, to the individual change - system change/agency-structure relationship, and the potential to integrate social and ecological dimensions in SE.

First however, we provide a brief theoretical framing. In this framing, it should be noted that the terms environmental education (EE), education for sustainable development (ESD), sustainability education (SE) and education for sustainability (EfS) are all used in our contexts. While there are debates about the terms and associated policy framings, we engage these here only in passing. The reader will also note that we use the concepts of *competencies* and *skills*, which are sometimes narrowly interpreted as task-based performances, as broader constructs with integrated behavioural, values and strong knowledge dimensions.

Sustainability education in a university context – What outcomes are we teaching towards, and what methods are appropriate?

We start the theoretical background in Southern Africa. Here there was historically, and is to this day, a strong focus on awareness-raising as the initial and sometimes only step in sustainability education (SE). Awareness-raising may take the form of emotional appeals to learners to take better care of nature (often linked to Christian religious values), single-message behavior change campaigns, or presentations of facts about environmental issues. The annual conferences of EEASA, the Environmental Education of Southern Africa, and many papers in the *Southern African Journal of Environmental Education*, illustrate this general trend, in schools and post-school contexts. The educator's need to raise awareness about environmental issues is understandable, given that we cannot respond to something of which we are unaware. Sometimes an awareness campaign may be necessary, for example, to warn people of contaminated water. However, ES cannot stop at raising awareness, and we also need to carefully examine some assumptions associated with awareness-raising approaches based solely on emotional appeals, or the transmission of facts about problems, particularly in the university education context on which we focus in this paper.

In the 1990's Australian and Canadian educators (Robottom & Hart, 1995) critiqued a behavourist approach to environmental education (exemplified at the time by the work of (Hungerford & Volk, 1990)), for the assumption that raising awareness or sharing facts will result in behavior change. They pointed to the studies that showed a poor correlation between awareness of issues and behavior change, and argued for different, for example critical, educational processes. They also questioned the assumption that individual behavior change is the main means of solving environmental issues. Issues ranging from climate change to poverty are complex and multi-facetted, and require systemic actions and structural change if they are to be resolved. In the face of this realization, the individual learner becoming aware of the scope and depth of sustainability issues can be left with a great deal of despondence (see e.g. Hart [REF]).

In South Africa O'Donoghue (1993) developed a useful response in the form of an active learning model for EE (see Figure 1). It draws in part on the constructivist critique of behaviourist approaches to education, which alerted educators to the need to mobilise learners' existing understanding as a basis for developing further (conceptual) understanding. He devised educational activities to engage learners in active meaning-making activities. His 'learning by doing' model includes 'tuning in' and 'finding out' activities, as well as 'action taking' that not only further engage the mind for conceptual learning, but also learners' sense of agency. The work of Danish environmental educators on action competence (Jensen and Schnack, 1993) was also relevant.

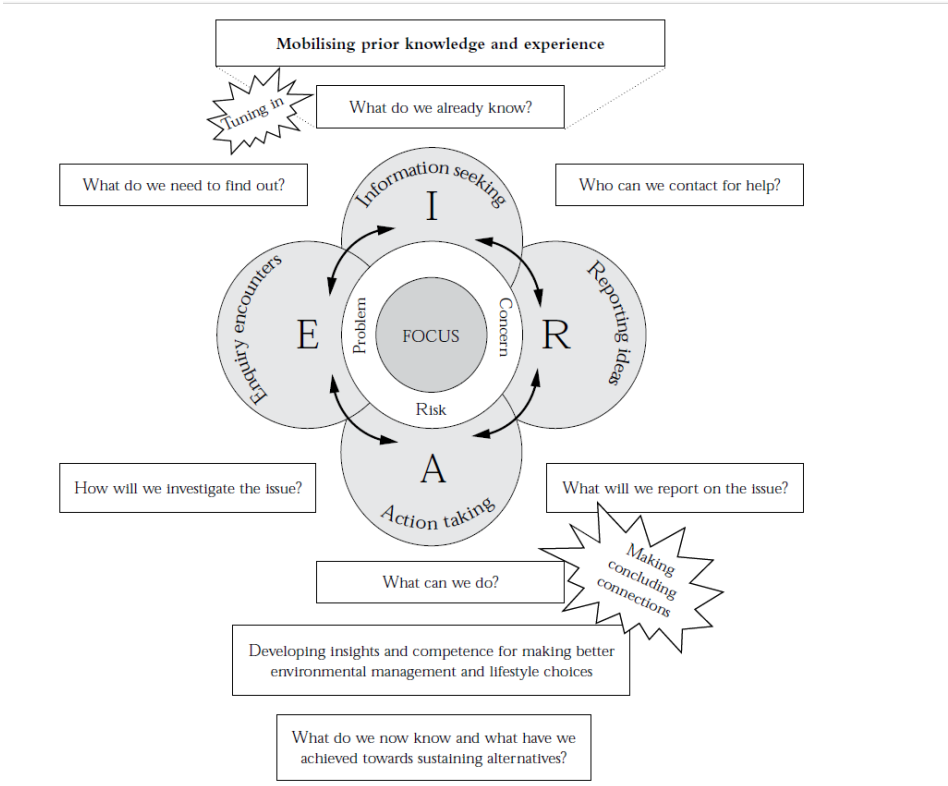

Figure 1: Active Learning Model, O'Donoghue, 2001 (republished with permission of the Southern African Journal of Environmental Education)

In Sweden, environmental education has been part of national curricula since 1969. The 1972 Stockholm Conference on the Human Environment inspired educational perspectives on environmental protection, particularly in science education. With the declaration of the

United Nations (UN) Decade of Education for Sustainable Development (DESD 2005-2014), the scope changed from environment, to sustainable development. Since then there have been many discussions in and beyond Sweden, regarding the ideological and political implications of various educational versions. In Swedish educational practice, sustainability education has been interpreted as transitioning from scientific knowledge and fact-based traditions, to broader approaches, taking into account the variety of values and attitudes defining individuals' participation, decision-making, critical-thinking and action competence (Öhman 2011, see also Östman, Almers, Björneloo, Jensen, Schnack). Today, perspectives on how to teach about the complex relationships between economic development, environmental protection and social justice at different scales, receive great attention in the Swedish educational system as a whole.

In South Africa, the broad, early (1972) UNESCO principle of a holistic approach to environmental education [REF], in which environment and development require simultaneous attention and learners need to understand environmental issues holistically, have generally been applied to EE, ESD and SE, with a strong transformative and social justice dimension emerging in the 1990s, linked to the country's efforts to address its politically and economically unjust past. The current national curriculum framework features critical cross-field curriculum outcomes which include the ability of learners to *identify and solve problems, using creative and critical thinking*, and *an understanding of the world as a set of related systems in which problem-solving contexts do not exist in isolation* [REF].

The Swedish national school curriculum (2011, revised 2018) notes that: "*An environmental perspective provides opportunities not only to take responsibility for the environment in areas where they themselves can exercise direct influence, but also to form a personal position with respect to overarching and global environmental issues. Teaching should illuminate how the functions of society and our ways of living and working can best be adapted to create sustainable development*." In other words, education should enable students to relate personal, everyday life in work places and in private settings, to global environmental issues. Being able to link the individual and personal to the socio-ecological system and associated structures, becomes central.

This resonates with international perspectives on what learning outcomes we should aim for, in a sustainability education in a university context. (Wiek, Withycombe, & Redman, 2011) usefully reviewed related literature and summarised what is being regarded as the desired learning outcomes in the sustainability sciences, as "key sustainability competencies". These include systems thinking, technical skills like modeling and forecasting, as well as complexes of interpersonal and normative, anticipatory and strategic competencies. In the Green Economy Learning Assessment: South Africa (Rosenberg, Lotz-Sisitka, & Ramsarup, 2018), we found that these sustainability competencies could be

usefully grouped in a broader framing for transformative leadership learning outcomes described by Scharmer (2009) as technical, relational and transformative competencies. We found that South African professionals addressing sustainability challenges (such as policy and practice changes towards a green economy and sustainable society) draw on a variety of overlapping technical, relational and transformative competencies, involving strong knowledge, understanding, values and practical abilities.

This background sketches some of the considerations that shape our curriculum and pedagogical practice as lecturers in sustainability education, at our respective universities, and the commodity value chain teaching and learning activities we have used. In the next section we describe the latter in some detail.

Context and Methodology: Using a Commodity Value Chain Activity for Sustainability Education in South African and Sweden

In South Africa, co-authors Rosenberg and Ramsarup have been collaborating since 2016 in a programme aimed at skills planners, policy makers and human resource developers in government and industry (www.greenskills.co.za). This included occupationally-directed studies in agriculture, mining, chemicals, paper and pulp, and state procurement, to explore how these sectors can 'green', extend, make circular, or entirely transform the value chains for the commodities and services they produce. The purpose was to identify leverage points for change (Meadows, 1999) and the associated tasks and occupations, so that the national post-school system could in a more concerted manner prepare people with the skills to work towards sustainability within those industries. We found that these skills were required in teams of occupationally different workers who need to collaborate to achieve fundamental changes in their core business. (Reports available on www.greenskills.co.za.)

In 2018 we started sharing the analytic tools used for these studies with educators (teacher educators, SE facilitators) and government officials, for example, at a national round table to launch the outcomes of the Green Skills programme, and in a provincial (Gauteng) environmental education forum. One of the tools was a value chain analysis, which educators experienced as pedagogically novel and rich. At the round table someone reflected that "*in 20 years working as an environmental educator, this is the first new approach I come across*". We started to use the method in more formal teaching contexts, including the 2019 Masters in Education course, on which we focus here.

We met Westermark during her academic exchange visit to South Africa, and discovered that Swedish educators were using similar commodity chain analyses with education students in Geography and Development Studies, and that here, too, the process showed potential to bring about profound insights and positive motivation. Westermark had been reviewing the method and its outcomes with a colleague, and is publishing the findings (*Westermark and Jansund*, in press). Case example 2 below draws on this analysis. First, we start with Case example 1, from South Africa.

Case 1: Rhodes University ELRC, South Africa, M.Ed. Course

At Rhodes University, the Masters in Education (M.Ed.) programme is international in nature, in that students come from South Africa as well as, *inter* alia, Namibia, Zimbabwe, Malawi and Zambia. In 2019, co-author Rosenberg introduced the commodity value chain activity right in the first week of this course. The students (a small group of 9) were joined on the day by two other staff and two post-doc researchers as well.

The value chain activity, some 2 ½ hours long, involved the following steps:

1. An introduction by the lecturer to the concept of a 'value chain' for producing commodities, linking it to the 'cradle to grave' concept with which some students were already familiar. This was done quite briefly. The overall task was then outlined.

2. Working in small groups, students started to investigate the commodity value chain of the plastic water bottle. Their information sources were a printed hand-out with some information about plastic production and waste (developed for the round table event mentioned earlier, by colleagues from Wits), and the internet, which they accessed via laptops or smart phones. They divided the tasks within the groups; some gathered information which others summarized, depicted or presented. They drew and made posters of the value chains using stick-on cards that could be moved around as new insights developed. While some seemed initially uncertain of how to proceed, it quickly became quite absorbing for all participants (see Figure 2).

Figure 2: Students and staff in groups constructing a value chain for the plastic water bottle

3. In the process of researching the sequence of processes involved in producing, using, discarding and perhaps recycling plastic bottles, participants had to also identify environmental issues along the way. To scaffold the process of searching for and making sense of factual information, a conceptual framing was provided, which encouraged the inclusion of social, economic, political and ecological dimensions. This framing (figure 3) was developed by (O'Donoghue 1993), linked to the 'green economy' work of Paul Ekins (1992), and to the 1992 UN Summit on Environment and Development.

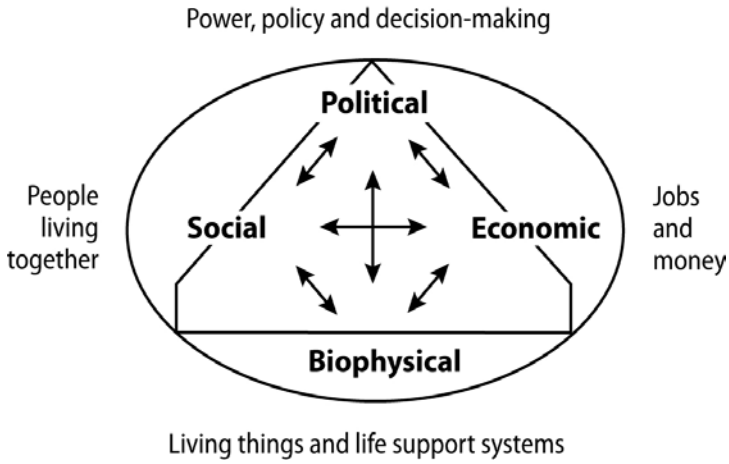

Figure 3: Conceptualization of 'environment' shared with students (O'Donoghue, 1993)

4. On completing this stage, the groups presented their posters with the value chains and associated issues to each other (see Figure 4). The gist of the value chains was similar but posters varied, for example in issues students chose to explore in more depth. This meant that each presentation shared new information, but everyone listening to their class mates understood where the new information 'fitted in'.

Figure 4: Students share the posters of their plastic bottle value chains

5. Following engagement with each other's posters, students returned to their groups for the next stage, which was to choose one 'hotspot' in the value chain and research what could be done about the issues at this potential leverage point for change. Groups were advised that a hot spot analysis should consider multiple criteria, for optimum benefit, that is: ecological benefits (such as a reduction in pollution) as well as social benefits (such as the

creation of employment, or the prevention of job losses, or improvements in human health). This step included an investigation of commonly proposed solutions (such as recycling plastic or replacing plastic with glass) which may in turn have their own environmental and social impacts.

6. After identifying the hotspots and proposed changes, the students unpacked the occupational tasks involved in the proposed changes in some detail, by identifying the people who (need to) undertake these tasks, where they are situated – in government, industry, homes, educational institutions - and what they need to do, in order to address the sustainability issues associated with this commodity. The outcomes of this second layer of 'finding out' was then shared in second round of presentations, after which some 'concluding connections' discussion (with reference back to the active learning model in Figure 1) ensued.

7. In the final step, two days later, further 'concluding connections' were made when students were asked to reflect on the educational potential of the activity. This involved a reflection on what they saw as the learning outcomes it could potentially address, based on their own experience. It took the form of a questionnaire with prompts outlining a range of possible learning outcomes possibly relevant to sustainability education. These were:

- New *awareness* of sustainability issues
- *Deeper* knowledge of sustainability issues
- Awareness, knowledge or joint identification of *solutions* to issues
- Developing *systems thinking*
- Clarifying *ethical* positions
- Inspiration vs Despair
- Collective or individual *agency*
- Problem-solving skills, action competence

Students (and participating staff) were asked to indicate whether they thought the activity they completed had the potential to address these learning outcomes, and to give examples from their own experience, to substantiate their answers. The 9 returned questionnaires formed the basis for the analysis presented in the paper, along with unsolicited comments posted on social media.

Case 2: Geography teacher education course, Jonköping University, Sweden

Blom-Mondlane and Jansund (2003) developed an educational method based on the time-geographic processual landscape including on-line software, Geotime, to visualize value-chains and analyze contextual relationships in time and space. Later, Jansund and Westermark (2013) developed the method further conceptually with reference to sustainable development from an individual and a social perspective. As such the model serves to analyze micro, and macro-level relationships in time and space. In an unpublished paper Westermark and Jansund (2019) elaborate on the teaching approach and analyze the

outcome of applying it in higher education between 2007 and 2015. The case example here draws on and further discusses that material.

The case example involves a five week course for undergraduates in higher geography education. The course includes central human geography themes such as population, natural resources, economic, cultural and political geography. Central geography concepts such as place, space and scales are interwoven throughout the course with perspectives on globalization and sustainable development. Human-environments relations are central and particularly framed in a time-geographic perspective (first developed by Hägerstrand in the 1970s). Hägerstrands' concern about environmental problems and the human actions causing them laid the foundation for an interdisciplinary perspective linking the biophysical and human spheres in society. As noted by (Ellegård, 2018), "*he identified a mismatch between what is planned to happen and the societal and material contexts in which the plans are to be implemented … Every commercial and private activity is performed by humans, as in a factory, shopping center or home. Consequently, this is also where concrete actions to counteract the effects can be taken*."

At the start of the course, the students received an assignment to work on throughout the course. The assignment objectives were multiple. At a general level, it aimed at developing students' understanding of interdependences of places and regions in a globalized world. More specifically it aimed at developing skills to apply both geographic and time-geographic concepts to analyze the complexity of commodity chains, how they link individual lives to global processes, linkages between places, and moving between geographical scales, to understand structures that have power over domains and the conditions of environmental degradation, protection and people's well-being. Another objective was to allow students to ask questions about and to identify sustainability challenges, their causes, effects and strategies to deal with them in specific contexts, and from social, economic, environmental and political perspectives. Students worked on the assignment parallel to lectures, course readings and gathering data they needed to perform the assignment.

A brief description of the assignment and the sequential order of the time-geographic analysis in parenthesis follows:

- Select a multinational company and one of its commodities. Collect information about the commodity and the company regarding the production process and sustainability issues. (Data collection phase)
- Make a map showing various locations in the world that are involved in the commodity chain/production system. Reflect on why different parts of the production process are located in these particular locations. (Applying data to a static traditional map)
- Make one or several individual path(s) based on the information you reported above. Systematically identify subprojects in pockets of local order and show their

spatial location along the x-axis and the individual path of the commodity along the y-axis. (Link time and space to identify process and relationships in time and space between different pockets of local order.)

- Reflect on sustainability aspects in the contexts that appear in the production system, in different locations and subprojects in pockets of local order. (Reflect and analyze contextual relationships by applying information about sustainability challenges from step one. Discuss causes and effects in subprojects in pockets of local order that may be proximate/immediate or ultimate in time and space.)

The students collect information through research on the Internet, conducting interviews, and reviewing documents. After reconstructing time-geographic production systems graphically, students pose questions about such issues as

- identification of sustainability challenges (e.g., effects on the environment, on the population, on the manufacturing process)
- causes and effects at different geographical scales (e.g., rules and regulations)
- relationships between sustainability dimensions (environmental, social, and economic)
- strategies for change at different geographic scales (e.g., individual, local, national, and global levels)

The approach allows students to expand and complement the graphical description, when relevant, with additional graphs on smaller geographical scales, to make the analysis more detailed. For instance, a sustainability challenge in a factory or in farming practices could be analyzed at the factory floor or in connection with the household.

A model example of a time-geographic graph that the students produced in their assignment and analyzed is presented in Figure 5.

The concept *pocket of local order* is central to performing a contextual analysis. A pocket of local order is defined as a domain where an order of activities is maintained as a result of how power is distributed and executed, making resources available to individuals, organizations, and society to fulfill goals of projects.

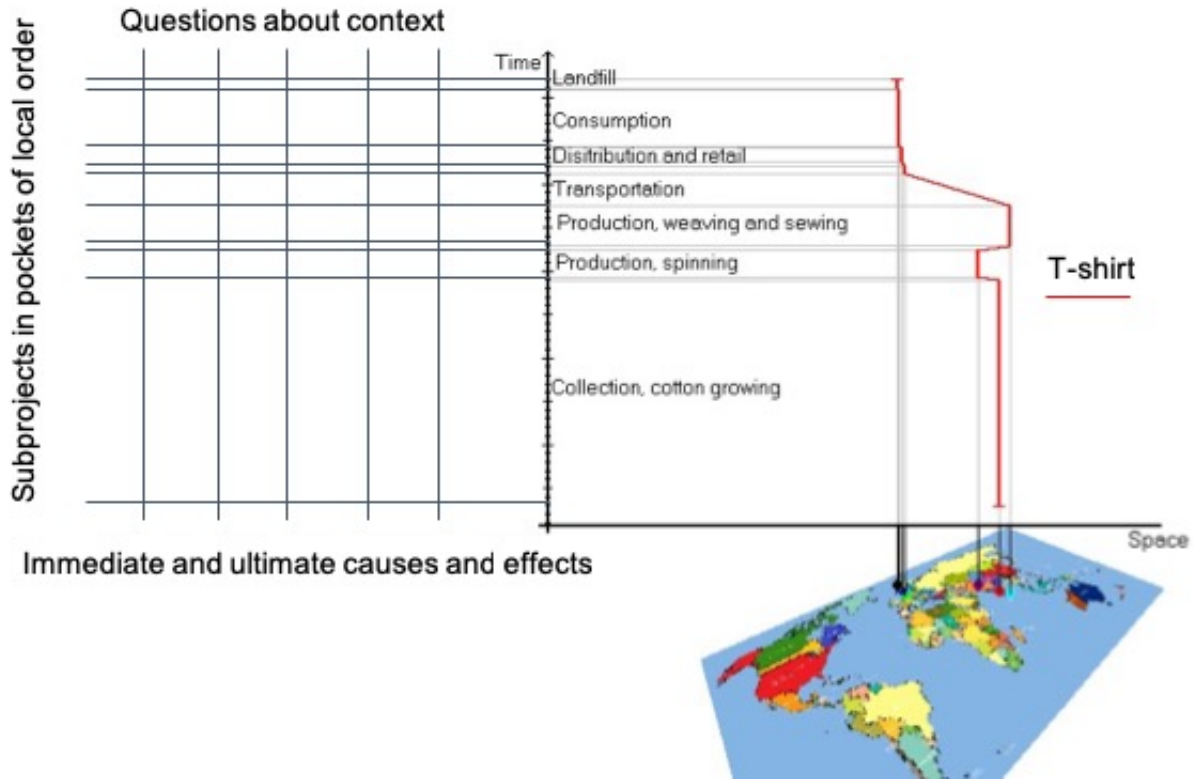

Figure 5: Model example of a time-geographic graph that students produced and analyzed

Many different contexts come into play in defining the outcome of the commodity chain (see Figure 5). The sequential time contexts refer to how subprojects are linked to each other and need to be performed in a certain order to produce the commodity. Inputs need to be available in the right place at the right time. Geographic contexts refer to many things, but at the most general level they refer to where phases in the production process are located and how the whole process is geographically distributed. Sustainability challenges are identified by applying a grid to the graph defining individual pockets of local order. Each can be analyzed with reference to how sustainability challenges appear as environmental, social, and/or economic dimensions. Questions about the immediate and ultimate causes behind such challenges and the effects of these causes refer to contextual relationships in time and space, and the time-geographic constraints. The questions may include the following: What sustainability challenges (or dimensions) are highlighted in the commodity chain as a whole or in its individual subprojects? How are different places, individuals, and production processes affected locally by sustainability challenges? What actors are responsible for changing their production process or lifestyle? What policies and strategies for development at global, national, regional, local, and individual levels lie behind a sustainability challenge and can help to address it?

In the next section, we share actual and potential educational outcomes of these two educational processes, starting with the South African case.

Findings regarding the Educational Outcomes and Potential

Case 1

The M.Ed. students at Rhodes University responded positively to the short commodity value chain analysis activity. They were engaged, judged by the degree of absorption as they worked on the group task, and the degree of animation evident as they presented their findings.

Following the learning activity, they completed a questionnaire, anonymously and without the lecturer being present. The purpose was to test the lecturer's assumptions about the potential of the exercise as an educational activity, *and* to encourage the students to reflect on the educational potential of the activity *as education students*, that is, as part of their learning process, what in O'Donoghue's active learning model (Figure 1) is described as making 'concluding connections'.

The following findings are based mostly on the questionnaire responses.

New awareness of sustainability issues

Everyone noted that they learnt something new during the activity, and for some it was a real eye-opener. For example:

> "*When talking about consumables, one hardly imagines the value chain and impact of it*"
>
> "*We don't always think of the impact of the products we buy, on the planet*"
>
> "*One tends to think of plastics as a carrier and not what it takes to produce it*".
>
> "*For someone who did not have any prior knowledge / awareness of the unsustainability of plastics, I believe the activity part of researching what that commodity chain is, allows one to discover the many issues associated with the plastic production, etc*."
>
> Awareness raised was not only about problems, but also about solutions:
>
> "*I learnt new / more ways on how to live sustainably*."
>
> Students noted that they learnt through their own research but also the inputs of other groups in class. For example:
>
> "*The presentation of group 3 deepened my knowledge on the used plastic bottle*."

Deeper knowledge of sustainability issues

All participants noted that they developed a deeper knowledge, e.g. around "the inter-related impact of plastic" and "a clearer picture of energy inputs and impacts". One participant remarked on social media that "*I knew how bad the plastics are but yesterday*

the amount of energy used in the production touched me so much". Another participant realized that "*producing a plastic bottle contributes to lots of sustainability issues like climate change*". Someone else who had been aware of sustainability responses like recycling, developed a deeper understanding of the nuances. "*I didn't know before that there are some bottles that cannot be recycled. So my thinking on buying bottles are vanishing now*" and another cited "*the complexity of recycling and additional costs that can be incurred in the recycling process*". A staff member noted that the value chain analysis seemed "*a very useful, solid way of accessing the complexity*".

Awareness, knowledge or joint identification of solutions or responses to issues

To avoid despondency and cynicism, and encourage agency, we want learners to understand not only of issues and problems, but also of possible responses and solutions. The participants in the value chain analysis noted that the activity had the potential to help develop this understanding. One participant simply noted that "*I realized what needed to change*" whilst another commented that "*the activity highlighted the importance of 'not a-one-size-fits-all' approach to solutions and that responses have to be implemented at various points in the chain*". Students noted that: "*I was able to identify alternative practices that were sustainable"*, "*we can all relate to the use of plastics and by understanding how it affects us we can brainstorm solutions*" and "*we co-jointly worked on finding solutions to the issue*". A staff member suggested that the activity *"enabled a systematic way [*of identifying solutions*]*".

Not everyone agreed that solutions were – or could be - adequately addressed in the activity: "*There are limited responses to the issue*", and another was concerned that the group did not come up with "*a unified, 'joint identification' of the solution*".

Developing systems thinking

Systems thinking is one approach to a deeper understanding of sustainability issues and solutions, and one of the cross-cutting learning outcomes in the South African school curriculum. In this regard, participants referred to: "*the interconnected nature of the sustainability issues associated with the plastic industry"*, "*the overlapping issues involved in plastic*", and realizing that one is "*an end user*" in the value chain.

"*I have experienced that during the activity, I came to develop an understanding of how systems are embedded within each other, socio-ecological*". "*I was able to see what other systems (bio-physical and social) were affected by purchasing a plastic product*". Respondents also commented on how the insights gained were relevant to their professional context, education, e.g. "*There is an interconnected link between politics, economics, education and environment*".

Clarifying ethical positions, Inspiration vs Despair and Collective vs Individual Agency

Not all students were, at this early stage of their course, clear on what the questions regarding ethical clarification referred to. Others understood the question, but were not

sure that the activity had the potential to clarify ethical positions. One respondent referred to "*a war of words between convenience, capitalism and alternative feasible options*".

Another related it to personal ethics and action and noted that "*Looking at my status in the community, I am not sure yet if I can manage to change this*". This comment also relates to agency, inspiration or despair (and these three matters are reported on jointly here). This student experienced uncertainty as to whether, as individual with a limited role, one can affect the necessary changes, and an ethical reflection on one's own role might therefore not be possible or appropriate.

Others felt the activity had the potential for ethical considerations, because "*each consumer does have ethical agency*"; "*I had to answer for myself what this awareness meant – should I make different choices that are more sustainable? How? What alternatives are there?*" Another reported that: "*Being aware to this new/deeper understanding compels me to do more / be proactive*".

The student who thought his or her role in the community was too limited to effect a change, was unsure whether the activity would lead to inspiration or despair, noting that "*collective and individual agencies need to work together to solve the issue*". Another felt that individual agency could be developed because "*I can change my actions, it could also lead to collective action but I can control my actions, to buy less plastic products or a recyclable one*". One participant noted that "*a great impact can be made individually and jointly"* with reference to a recollection that *"during the activity, we identified people who can contribute in changing the status quo*".

One participant found inspiration in thinking "*of my own contribution to sustainability issues*", and the majority felt the activity could foster inspiration rather than despair, exemplified by response such as "*I came away thinking this was a problem worth solving*" and "*I was inspired by the activity to take sustainability steps such as recycling / using glass bottles*". A staff member reflected: "*I think the search for 'hot spots' was a very useful idea. Not only empty inspiration, but empowering in terms of supporting tangible change*". And indeed it would seem that the activity has the potential to develop informed inspiration tempered with an understanding of the depth of the problem. As one participant noted: "*After the exercise, I am inspired. Although plastic is already in the system, I can do my bit at any one point*." On the day after the activity, two participants sent unsolicited WhatsApp messages to a shared group: "*I am determined never to buy another plastic bottle again after today's session. Thank you*." and "*I have decided to use the same plastic water bottles I have and never to buy another one for the whole year. Thank you*".

The latter participant's response hinted at a social justice angle. She said it was in particular the high amount of energy that is used in the production of plastics, that "touched" her, because in her home country (Malawi) she was researching energy conservation among rural women with no access to electricity, who relied on cook stoves stoked with wood and charcoal. The contrast between this lived reality, and the vast amounts of energy used to produce plastic containers, elicited an ethical 'behaviour change' response.

Problem-solving skills, action competence

One student did not understand what the question referred to, and no-one mentioned action competence by name. But most respondents indicated that the activity had the potential to develop problem-solving skills: "*a great chance for me to develop my problem-solving skills*"; "*looking at the problem and come up with strategies on how to solve it*"; and "*after understanding the value chain, one is able to revisit [one's] perceptions and decide on a decision / action*".

The matter of deciding what individual actions to take in response to the issues and solutions explored, was also linked to problem solving.

One respondent, however, was unsure of the problem-solving potential, noting that "*different consumers view their agency differently, and have different socio-ecological concerns*". The feedback highlights the need for flexibility in the focus of the chosen commodity (for many, a focus on water may be much more relevant than the container in which it comes).

Next, we turn to an analysis of the learning outcomes related to the commodity chain analysis in Jonköping University.

Outcomes from case 2, Jonköping University

In the case of the Geography Education course, data was available from 58 examination papers, produced over several years, which were analysed. Educators Westermark and Jansund (2019 in press) found *inter alia* that:

- Students were able to make linkages between social, environmental and economic dimensions, and time and space linkages
- Students were able to reflect on effects and causes, and
- Students were able to reflect on strategies for change (ibid, p.19).

There were multiple ways to solve the assignment, and students were encouraged to be creative in their approaches. Students themselves delimited their studies and defined specific objectives to focus on, and this resulted in considerable variation in students' identification and reflections on sustainability challenges. Access to data varied greatly depending on choice of commodity and company. Some groups had more ambitious aims than others in performing the contextual analysis. In general, those with high ambitions in the analysis, also demonstrated more elaborate reflections regarding the causes and effects of sustainability (ibid, p.18).

In their contextual analyses, students highlighted examples of companies' good and bad practices regarding sustainability challenges and strategies for change. There was also a significant personal dimension to the assignments. Students tended to choose commodities that they themselves consume in their everyday lives. They also chose multinational companies that have at least one production phase located in their personal proximities. Furthermore, papers included many comments and conclusions referring to personal

consumption patterns, as well as expectations and suggestions of strategies for change that would make their personal consumption and everyday lives more sustainable (ibid, p.22). Therefore, while the students gained a broader, structure-related perspective, the assignment also engaged them in ethical and personal agency related reflections.

Discussion and Conclusions

The analysis of sustainability challenges and formulation of solutions, are complex processes. Educators need tools to teach sustainability education, and at university, student educators need opportunities to practice and learn how to use such tools, at the same time as they develop a deeper understanding of sustainability issues and their own responses to it. In this paper we reflected on commodity value chain analyses as one such tool for SE. We did so sharing two instances where independent of each other, we have been using this methodology for SE with student environmental educators and student geography educators.

Our teaching and learning activities differed, in that the South African example was shorter and not examined, while the Swedish example involved a longer, examined project. The one gist of the activity was in many ways similar, however.

The findings from the two case examples suggests that these value chain analysis methods can both address challenges outlined at the start of the paper, through the potential to raise awareness about environmental issues but also to extent ES beyond awareness raising, by:

- Extending and deepening understandings about the interconnected nature of sustainability issues
- Encouraging reflection on the links between individual and collective agency
- Encouraging learners to reflect on their own agency and responsibility as decision-making consumers and make decisions about changing their own actions.

Regarding awareness, in the South African M.Ed. course we saw that students were surprised to learn about aspects of plastics of which they had been unaware, but also that they learnt about solutions to a point where they could formulate responses for themselves as consumers, and other roleplayers. Beyond a heightened awareness of the issues involved ("*I came away thinking this was a problem worth solving")* they also developed a deeper understanding, for example, learning that commonly promoted 'solutions' to the unsustainable aspects of the value chain, such as recycling, may have secondary effects, and limitations ("*I learnt that not all plastics can be recycled*") and could create further problems (e.g. more energy used during recycling). They encountered nuances and complexities of problems and solutions (glass can be re-used much more often that plastics, but glass weights more which means that transporting it, uses more fuel – unless transport is also 'green'). Engaging with the available information in this way means that learners are less likely to become disheartened if, after an initial spark of awareness about an issue and embracing an immediate solution ("*superficial motivation*"), they could become despondent if, in the execution of that solution, they run into obstacles.

In both contexts the activity directly addressed systems thinking and problem-solving from a systems perspective, which are intended learning outcomes of the curricula in both countries. In both case examples, we noted considerable potential for students to learn from each other. This was an important finding, as it starts a process of positioning students to recognise themselves as sources of information and insight, and to also look to peers for valid insights. This is particularly important where students come from authoritarian educational backgrounds, as in some African contexts, which can limit individual agency.

Importantly, the students were able to use their own knowledge and experience, but also to build on this knowledge and develop new awareness, knowledge and insights. There was unfortunately less available information for some of the commodities and companies chosen by Swedish students. However, where information was available, from the internet and other resources used, and within the carefully developed structure and conceptual framing of the assignments, it seemed to make available to students "an amazing world of awareness and potential for change" (Westermark and Jansund, in press, p.28).

Discovering how much is known about a commodity and how much is already being done to address the known sustainability challenges, seemed to carry many students beyond a point of despondency, to where they could see not only what industry can do to change matters fundamentally – or incrementally – but also what they themselves could do. This point emerged as one of the main strengths of the value chain analysis as educational method. It directed students to look for points where change should and could be possible, and to identify the actors responsible for those changes, even naming them, at least by their occupational title (in the South African example). This helped with an insight that systems and structures are made up of people with opportunities to change (drawing on their technical, relational and transformational competencies) that in turn are shaped by other people, who also have some, if limited, agency (Archer, 2000). In the process of observing the interplay between structure and agency in commodity value chains, students could rise beyond a superficial sense that individual consumers have the responsibility or power to change everything; but also to rise above a cynical sense that individuals cannot do anything, because structures (or collectives) need to change, if we are to see any difference. The responses from the students on the South African course showed that, in the activity, they viewed themselves both as consumers of plastic who can change their consumer practices, and as educators who can engage with other points in the system, such as producers, legislators, policy developers, or other consumers, qua educators. That is, they are agents in their individual sense and agents engaging with structures.

The Swedish course extends over a longer time, benefitted from the time-geographic perspective that help learners understand that people live their lives in different contexts and that structures will have different effects on their options, how they make decisions and how they can implement their plans. Individuals' lives change over time and their interactions with their environment will define their opportunities for a good life, at the same time as they make use of resources and transform the landscape. Hägerstrand (2009) called this the processual landscape and he strived to capture how individuals couple with complex sets of material and immaterial processes in geographical areas (See also (Ellegård, 2018) . This brings a deeper understanding of human agency in relation to structure, a

relationship that may change over the life of a person, from student, to worker, and from consumer to producer, in different contexts.

This deeper engagement could perhaps overcome the limitation found in the South African example. Here some students felt that there are only "limited responses" to plastics' sustainability issues, and were concerned that the solutions identified during the short activity (and perhaps more widely available) were not "unified". While some students valued the sense that one could intervene in the system "at any one point", there is also merit to the view that concerted efforts and therefore at least some consensus may be needed, to address sustainability challenges.

Could this limited outcome for some students be overcome in a more extended engagement, as in the Swedish example, where students worked together over a longer period of time, during which they could also interview roleplayers in the value chains they were exploring. Does that help learners to develop a deeper sense of one clear strategic response to a problem, around which strong consensus for action can be developed? It could be worth asking the same set of questions related to learning outcomes in the South African example, to completers of the Swedish courses, given the bigger sample this would constitute, as well as the more extended methodology, with the time-geographic dimension included, to evaluate. It would also be interesting to further use the value chain analysis with roleplayers in industry (as started in the Green Skills programme) to explore the extent to which it can support actual engagement with changing practices.

Although the evaluation methods used for this paper were mixed and limited in a number of aspects, we believe that there is adequate evidence that the commodity value chain analysis is a useful teaching tool, with strong potential to addresses some of the challenges faced by SE educators, viz, focussing on individual choices within the context of wider systems and structures, exploring the ecological but also the social, economic and political dimensions of sustainability issues, and the range of systemic responses necessary to realistically address sustainability issues, them. Hence it reduces the risk of educational activities that focus solely on moral calls for individual behaviour change or technical information about problems and either leaves learners despondent about the scope of the crisis, or unmoved in terms of personal responsibility, and creates instead an invigorating and potentially empowering process and outcomes.

At its heart, a supported commodity value chain analysis can inspire individual learners to change their own practices and decisions, while recognizing that in order to effect system level changes, they will need to engage with and team up with others. A broader range of SE activities will be needed to build the technical, relational and transformational competencies needed in such engagements. The UNESCO Global Action Plan (GAP) includes sustainable production and consumption as a key content dimension [REF]. The paper has shown that the analysis of commodity value chains, as introduced here, is an ES activity with considerable potential in this regard. It has also demonstrated the value of comparing international and sustainability education practices across different contexts, as this analysis has already given ideas for further research and practice.

REFERENCES [INCOMPLETE]

Archer, M. S. (2000). *Being human: the problem of agency*. New York: Cambridge University Press.

Blom Mondlane, U., & Jansund, B. (2003). Geografi - didaktik - praktik : interaktiva studier av förloppslandskapet Göteborg: Kulturgeografiska institutionen, Handelshögsk Univ.

Ellegård, K. (2018). *Thinking Time Geography: Concepts, Methods and Applications* (1st ed.). https://doi.org/10.4324/9780203701386

Hägerstrand, T., Ellegård, K., Svedin, U., & Lenntorp, B. (2009). Tillvaroväven Stockholm: Forskningsrådet Formas.

Hungerford, H. R., & Volk, T. L. (1990). Changing Learner Behavior Through Environmental Education. *The Journal of Environmental Education*, *21*(3), 8–21. https://doi.org/10.1080/00958964.1990.10753743

Jansund, B., & Westermark, Å. (2013). Tidsgeografi i undervisning för hållbar utveckling: En helhetsorienterad tankemodell. Geografiska Notiser, 71(1), pp. 24-40.

Meadows, D (1999). Leverage Points: Places to Intervene in a System. The Sustainability Institute.

O'Donoghue, R. (Ed.) (1993). The Environment, Development and Environmental Education. A working document of sources and perspectives for policy and curriculum initiatives in formal education. Share-Net: Howick.

O'Donoghue R (Ed.) 2001. Environment and active learning in OBE: NEEP guidelines for facilitating and assessing active learning in OBE. Howick: ShareNet

Öhman, J. (2011). Theme: New Swedish environmental and sustainability education research. *Utbildning & Demokrati*, *20*, 3-12.

Robottom, I., & Hart, P. (1995). Behaviorist environmental education research: Environmentalism as individualism. *Journal of Environmental Education*, *26*(2), 5–9.

Rosenberg, E., Lotz-Sisitka, H. B., & Ramsarup, P. (2018). The green economy learning assessment South Africa: Lessons for higher education, skills and work-based learning. *Higher Education, Skills and Work-Based Learning*, *8*(3), 243–258. https://doi.org/10.1108/HESWBL-03-2018-0041

Scharmer, O. (2009). *Ten propositions on transforming the current leadership development paradigm*. Presented at the World Bank Round Table on Leadership for Development Impact, Washington DC, United States.

Sund, Louise & Öhman, Johan (2011): Cosmopolitan perspectives on education and sustainable development – between universal ideals and particular values. Education & Democracy, 20 (1),13-34

Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science*, *6*(2), 203–218. https://doi.org/10.1007/s11625-011-0132-6.