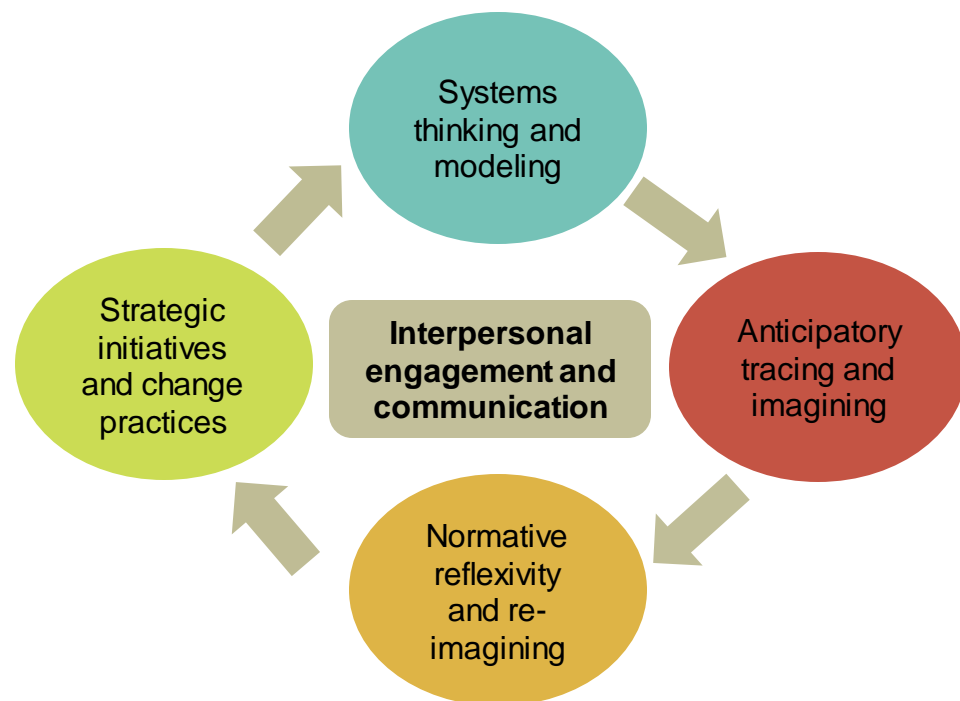


EMERGENT CURRICULUM AND SUSTAINABILITY COMPETENCIES IN ENVIRONMENTAL LEARNING

Antonia Mkhabela's Master's research was inspired by the South African 2013 *National Diagnostic Report on Learner Performance*, which highlighted learner struggles with application of knowledge, evaluation, synthesis and analysis. These are skills typically associated with higher order questions in examinations. Antonia's study focused on CAPS Life Sciences curriculum-defined cognitive skills and levels (e.g. 'listing' as a low order skill, 'explaining' as a medium order skill and 'discussing' as a high order skill).

With three Grade 11 Life Sciences teachers, Antonia employed questionnaires, stimulated recall interviews, observation (of lesson plan implementation in classrooms) and document analysis (of lesson plans, assessment tasks and learners' work) to generate data. Formal assessment tasks were analysed by reviewing the numbers of high, medium and low order questions that were achieved across different percentage ranges by six learners. Because these curriculum competencies were emerging within a series of **environmentally-focused** Life Sciences activities, they were also examined in relation to the simultaneous emergence of sustainability competencies.

These sustainability competencies were a set of integrated competencies as defined by Wiek Withycombe, Redman and Mills (2011).



The first teacher focused on population ecology using quantitative modelling and the mark-recapture technique. Exploration of natality, mortality, immigration, emigration and migration supported the development of **systems thinking competence**. The teacher required the demonstration of **anticipatory competence** in an informal discussion about the effect an increase in population would have on natural resources. However, the quantitative modelling skills built during the lesson were not helpful in providing a social-ecological systems perspective and this competence was undermined by over-reliance on tacit knowledge. In an informal assessment task, less than a quarter of the high order questions were achieved at 60% plus, with half of these being achieved at less than 30%. All of the medium order level questions were achieved at 60% or more.

In the second teacher's lesson, learners were given a questionnaire to assess their individual carbon footprints. Teacher explanations of deforestation and ecological footprinting facilitated an understanding of social-ecological systems (**systems thinking competence**). The teacher highlighted that an increase in human population would have a negative impact on plants, the soil and animals and this demonstrated an **integration between systems thinking and anticipatory competencies**. In a formal assessment, assignment almost half of the total possible points for low, medium and high order skills were achieved at 60% and above. The third teacher's lesson focused impact of society, economy and technology on water quality (**systems thinking**). Learners anticipated diseases like cholera that might occur due to poor water quality (**anticipatory competence**). The teacher appealed to learners to come up with a solution to minimise water problems in their area (**strategic competence**). This lesson demonstrated a clear integration between the three competences. In an informal assessment task, for both high and low order questions, all were achieved at 60% and above, while more than 4/5 of the points for the medium order questions were at 60% and above.



The findings are not entirely conclusive but they seem to suggest that lessons that focus on integrated sustainability competencies might be well-placed for developing associated higher order thinking skills. The findings also indicate that sustainability competencies cannot be developed in isolation from each other and that it is an integrated approach to sustainability competence as suggested by Wiek et al., that has the potential to develop deeper understanding of social-ecological concerns. Recommendations from this study are for teacher training to emphasise an integrated competencies approaches to teaching environmental topics in Life Sciences. Training should also highlight the potential for complex environmental concerns to stimulate the higher order thinking skills in learner performance that are reported to be of national concern.

REFERENCES

Wiek, A., Withycombe, L., Redman, C.L., & Mills, S. (2011). Moving forward on competence in sustainability. *Environment-Science Policy Sustainable Development*, 53, 3-13