

‘Teach us How to Think About Science’: Developing a Curriculum Framework for a Flexible Learning Centre Context

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The study described is an Australian Research Council funded project titled ‘Re-Engaging Disadvantaged Youth Through Science’. The purpose of the project in its entirety has been to build a framework for guiding scientific teaching practice in the context of working with students with complex needs and diverse backgrounds who attend an alternative schooling system - the Edmund Rice Education Australia Flexible Learning Centre (EREAFLC) Network. A responsive methodology necessitated a deep understanding of both the needs of the staff and young people attending the centres as well as the embedded alternative philosophy acting as the foundation of the FLC approach to engaging young people from diverse backgrounds. The validity of the project has been judged against the responsiveness of the developed framework to the socio-cultural factors shaping the FLC context.

Project Methodology

This four year longitudinal project has involved working in close partnership with teaching staff at a Flexible Learning Centre site in North Queensland to trial and self-evaluate units of work with a science education emphasis. Data sources have included classroom observation notes acquired through extended time in the field, semi-structured interviews with teaching and support staff and a review of key organisational, policy and curriculum planning documents. Qualitative analysis of this data through a process of coding and progressive focusing (Simons, 2009) has been directed towards producing case studies which illuminate the range of pedagogies employed by Flexible Learning Centre staff in order to engage diverse young people in science. It is a study of the particular in depth and as such, employs non-cross-sectional data organization to enable examination of discrete parts of the overall data set (Mason, 2002). These distinctive elements have then been refracted against the context to establish a set of common themes that find resonance within a

socio-cultural theoretical orientation towards science education and form the basis of the proposed curriculum framework.

The table below maps the research questions to the methods enacted within the research design.

Research Question	Methods
What does science education mean in the Flexible Learning Centre Context?	Interviews with EREAFLC Network Staff, review of EREA curriculum documents and researcher involvement in network and site planning days.
What is the nature of teaching and learning science in the Flexible Learning Centre context?	Longitudinal case studies of three teaching sites, cooperative inquiry with case study teachers, collection of classroom artefacts and email/phone correspondence.
How does the Flexible Learning Centre context shape science education?	Interviews with teachers across the EREAFLC Network, pre and post interviews with teachers at case study sites and participant observation notes.
Working with EREAFLC staff, how do we develop a framework to guide science education curriculum development that is responsive to the needs of the context?	Data Analysis – Establishing a common narrative, refracting data against the context, member-checking, identifying future directions.

Developing a Framework of Science Education

Developing a framework of science education for the EREAFLC context has been a cyclic process of collaboration with teaching and network staff and is in the final stages of refinement. Rather than a prescriptive document, the completed framework is intended to be a stimulus for encouraging teachers to think about science curriculum and takes the form of a series of questions that highlight the value of inclusiveness, diversity and place within the broader conceptualisation of science for everyday life (Aikenhead, 2006). It is expected that this framework will provide a basis for establishing an ongoing dialogue around science curriculum across the Flexible Learning Centre Network and will act as a platform for professional development. An outline of the proposed framework that draws on a combination of data, theory and researcher experience is provided below.

Thinking about Science Curriculum Framework (Wilson, Lake & McGinty)

Focus Area	Guiding Questions	Key Reflective Question
Relevance	How does this topic connect to young people's needs, strengths and interests? How is this topic relevant to young people's everyday lives? What local resources (including social capital) can be used to make the content relevant?	<i>How does this topic encourage young people to think deeply about issues that matter?</i>

	<p>Does exploration of this topic serve an authentic purpose?</p> <p>How might this topic connect to local community concerns?</p>	
Place and Community	<p>Can this topic strengthen a local connection to place?</p> <p>Does this topic invite local partnerships?</p> <p>Does this topic position young people as contributors to their school, family and cultural communities?</p> <p>Where does this topic fit within the big picture, both local and global?</p> <p>How can diverse world-views be acknowledged and valued?</p>	<p><i>Does this topic encourage a sense of reciprocal responsibility between young people and their community?</i></p>
Experience	<p>How does this topic demonstrate practical utility?</p> <p>How can hands-on practical activities be incorporated?</p> <p>How can familiar and accessible resources be employed to develop creativity?</p> <p>How can scientific process skills be meaningfully integrated?</p> <p>How can young people's ideas to adapt and develop an activity be accommodated?</p>	<p><i>Are their opportunities for students to develop their understanding through practical experience?</i></p>
Creativity and Problem Solving	<p>What real-world issues are associated with this topic?</p> <p>Are their varied pathways for young people to work through and interact with this topic?</p> <p>Can technology assist with enhancing the creative elements of this topic?</p> <p>How can young people be encouraged to further develop their problem-solving skills?</p> <p>What are the key scientific concepts that the young people will need to access in order to draw conclusions?</p>	<p><i>Can young people use their cultural capital and creativity to problem solve?</i></p>
Transferability and Implications	<p>How can young people be supported to connect science learning to their everyday lives?</p> <p>How does this topic engage with local/community issues?</p> <p>How are these concepts applied in other contexts?</p>	<p><i>How can science learning increase a sense of agency and connection for young people?</i></p>

	<p>Does this topic link to science-related debates in the media?</p> <p>Could participant advocacy play a role in regards to acting on issues related to the topic?</p>	
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Exploring the Framing Process

Context Framing

Long term engagement with the FLC Network over a period of four years – extending beyond the science education program to include participation in planning events, celebrations and involvement with sites outside of the primary research site – allowed consideration of how individual site practices might translate into a more generalised form of curriculum framework. It was necessary to have a deep understanding of the principles, values and strategic intent of the network to ensure that the proposed framework would demonstrate fidelity to the EREAFLC vision (for organisation information, see EREA, 2010).

Theoretical Framing

Feeding into this framework was four years of study of literature in the science education field considered sympathetic to the philosophical underpinnings of the research setting. While science education for disengaged young people remains an under-developed field, particularly in the Australian context, synergies were found between FLC philosophy and the fields of place-based, outdoor and environmental education (see, for example, Woodhouse & Knapp, 2000; Smith, 2002), as well as the works of theorists with an interest in exploring issues of student relevance, agency and connection as understood within a humanistic orientation towards science education (see, for example, Aikenhead, 2006; Tytler, 2007). In regards to working specifically with young people from diverse backgrounds, the international works of Seiler (2001), Calabrese Barton (2003) and Tobin et.al (2005) provided insights into the possibilities of science education when reframed to meet the needs of high demand contexts.

Practice Framing

Engaging in a process of co-authoring research publications with teacher participants was particularly useful in enabling a dual researcher/researched theoretical framing of participants' practice. In this sense, the researcher was in service to participants by assisting them to articulate, legitimise and promote 'that which works well' for disengaged young people. Through this process, the methodological approach embraced some of the principles of 'advocacy ethnography' as espoused by Smyth and McInerney (2011) in that it intentionally sought a positive framing of teacher pedagogical practice as a mark of respect for the complex and challenging work that teachers do in these places. The co-authoring process also allowed for a very natural inclusion of member-checking as a validity process in that teachers had significant input into the representation of their own practice.

Structural Framing

The framework itself is structured as a reflective instrument and a tool for inspiring dialogue around science education curriculum. The questions in this framework have been phrased to invite conversation, dialogue and the creation of more questions. It draws on the ideas of Bill Ayers (2010) who conceptualises curriculum as a living challenge and a tool for thinking rather than a recipe to be followed. He advocates the use of questions to inspire thinking around curriculum and this approach seemed well-suited to a position of respect for teacher expertise. This was further reinforced by a teacher participant request during the course of the research process to ‘teach us how to think about science’ - seemingly an invitation to a meta-cognitive rather than prescriptive approach to curriculum development. The brevity of the document is intentional, designed to engage quickly but convey thoughtful consideration and reflection of the needs of both teaching staff and young people at the Flexible Learning Centres. It bears echo to the thoughts of progressive educational theorists such as Dewey (1929) and Glasser (1969) in its experiential and personal orientation. It finds resonance within those areas of study that challenge traditional curriculums to move more towards a general capability skill set considered more in tune with a 21st century knowledge based society (see, for example, Leadbeater, 2008).

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