Diorama and young people's exploration of sustainable communities.

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Dioramas and models

- A diorama is a model representing a **scene** with three-dimensional figures (Rose, 2016), either in miniature or as a large-scale museum exhibition
- Dator (2014) argues that **future-oriented thinking** could be incorporated into school programmes providing rich opportunities for students to connect with real-world issues, and importantly to **envision a future.**
- Diorama modelling can **locate the learner in an imaginary habitat**, where personal perceptions of scale and role play can be employed (Pink, 2015).

Rationale: Aotearoa New Zealand Curriculum (2007) highlights four principles

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Future-focused issues are a source of learning opportunities. They encourage the making of connections across the learning areas, values, and key competencies, and they are relevant to students' futures. Such issues include:

sustainability – exploring the long-term impact of social, cultural, scientific, technological, economic, or political practices on society and the environment

citizenship – exploring what it means to be a citizen and to contribute to the development and well-being of society

enterprise – exploring what it is to be innovative and entrepreneurial

globalisation – exploring what it means to be part of a global community and to live amongst diverse cultures

(NZC, 2007, p. 39)

Rationale: As educators we ask ourselves, what is the purpose of education?

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- Is it simply to fill our students with knowledge?
- What knowledge, whose knowledge?
- Will we **just reproduce society as it is now**?
- Or might we develop citizens who can transform (change) our world for the better, for all, forever by addressing future sustainable communities?

Rationale

From *Agency in the Anthropocene* - A framework for the 2025 PISA

A 15-year-old student who demonstrates in the Anthropocene can:

- Explain the **impact of human interactions** within Earth's systems.
- Make **informed decisions** to act on evaluation of diverse sources of evidence and aplication of creative and systems thinking to regenerate and sustain the environment.
- Demonstrate **respect for diverse perspectives**, and **hope**, in seeking **solutions** to socio-ecological crises.

- White, P., et al. (2023). Agency in the Anthropocene: Supporting document to the PISA 2025 Science Framework.

The case study

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- The case study involved **Year 9-10 students (13-15-year-olds) with a 10-week cross-curricular** (science, social studies, health and technology) inquiry using a future-oriented scenario. Students constructed a **diorama** which modelled their visions of a future home and community set in the **year 2100**. A sustainable life for a family was expected.
- Students were learning the topics of climate change, sustainability and futures thinking.
- **Teachers** had specialist subject knowledge of **science, technology, health and social studies.** The students (n=53), had a range of ethnicities and socio-economic backgrounds.
- The research involved schools in the Bay of Plenty region

Research questions

1. In what ways can **diorama construction enact reasoned interactions** in future-oriented inquiries?
2. What are the conditions under which diorama enacts reasoning and learning processes?

Research design

- Qualitative data were gathered through a series of professional learning teacher workshops, where notes were taken and analysis of the planning documents. **Semi structured interviews took place with the students**, these were audio taped, transcribed and analysed according to themes (Braun & Clarke, 2006).
- Jensen's (2002) dimensions of knowledge as a theoretical lens was used to analyse the students' responses in the semi-structured interviews. The responses were categorised and placed in a **time-ordered matrix** in order to show the development of their understandings.
- **Classroom video and sound capture** was conducted in ten single recorded one-hour sessions.

Four dimensions of knowledge

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Interpretations of (Jensen's, 2002) four dimensions of action-oriented knowledge.

Effects – the "what" of the environmental issue	Students investigate problems, the 'science' E.g. What is the cause of deteriorating air quality?
Causes – the "why" of the environmental issue	Students develop an understanding of the root causes of an issue. This often includes societal/cultural/economic factors. E.g. car use behaviour/ public transport perceptions.
Change Strategies – the "how" of the environmental issue	Students develop strategies for change involving community/collaborative input. Teachers explore with student's opportunities to encourage cooperation, analyse power relations and link to political/sociological studies.
Visions – the "where to"	Students are enabled to develop an alternative vision of the future. Investigating how other cultures/places address issues, can motivate students to enact change close to home.

Four images of the future

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- Four images of the future (Dator, 2009) were incorporated as scenarios to forecast alternative futures.
- Rather than ‘doom and gloom’ outlooks, students considered both climate science knowledge and a wide range of future scenarios to emphasise that the future is not “fixed” or inevitable.
- More in-depth scientific knowledge of an issue does not necessarily create motivation to change a problem.

Future not fixed

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Interpretations of the four images of the future (Dator, 2014)

Future images	Description
Continued growth	Business as usual. This can be a dominant view where the same fundamental processes will still be operating in the ways they do today.
Collapse	Unable to carry on as is. Collapse of society, or country or organisation where unknown consequences may occur.
Disciplined society	Tie ourselves to fundamental values that we must live by and we must discipline ourselves as we cannot have unrestrained economic growth.
Transformation	Unknown novel future. This is where we fundamentally change the way we live now, what this future will actually be like is impossible to define. Emerging technologies can help.

Construction and dialogue

- Students exercised agency using role play
- They negotiated steps in the construction of the diorama.
- They shared their own and others' input.

Reasoning and dioramas

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There were different forms of **reasoning** through diorama construction. The diorama functioned as a kind of **generative** reasoning process in that the students were actively involved through constructing, negotiating, and refining visuo-spatial claims. Diorama construction functioned as a **communicative** process where students used talk to communicate and report ideas.

The students' responses about taking action

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"What action can you take to help minimize climate change?"

At post inquiry interviews 42 (79%) students could list ten or more actions that could help to minimize climate change, whereas only two (4%) students could list six actions that could help to minimize climate change at the pre-inquiry interviews.

Key research findings 1

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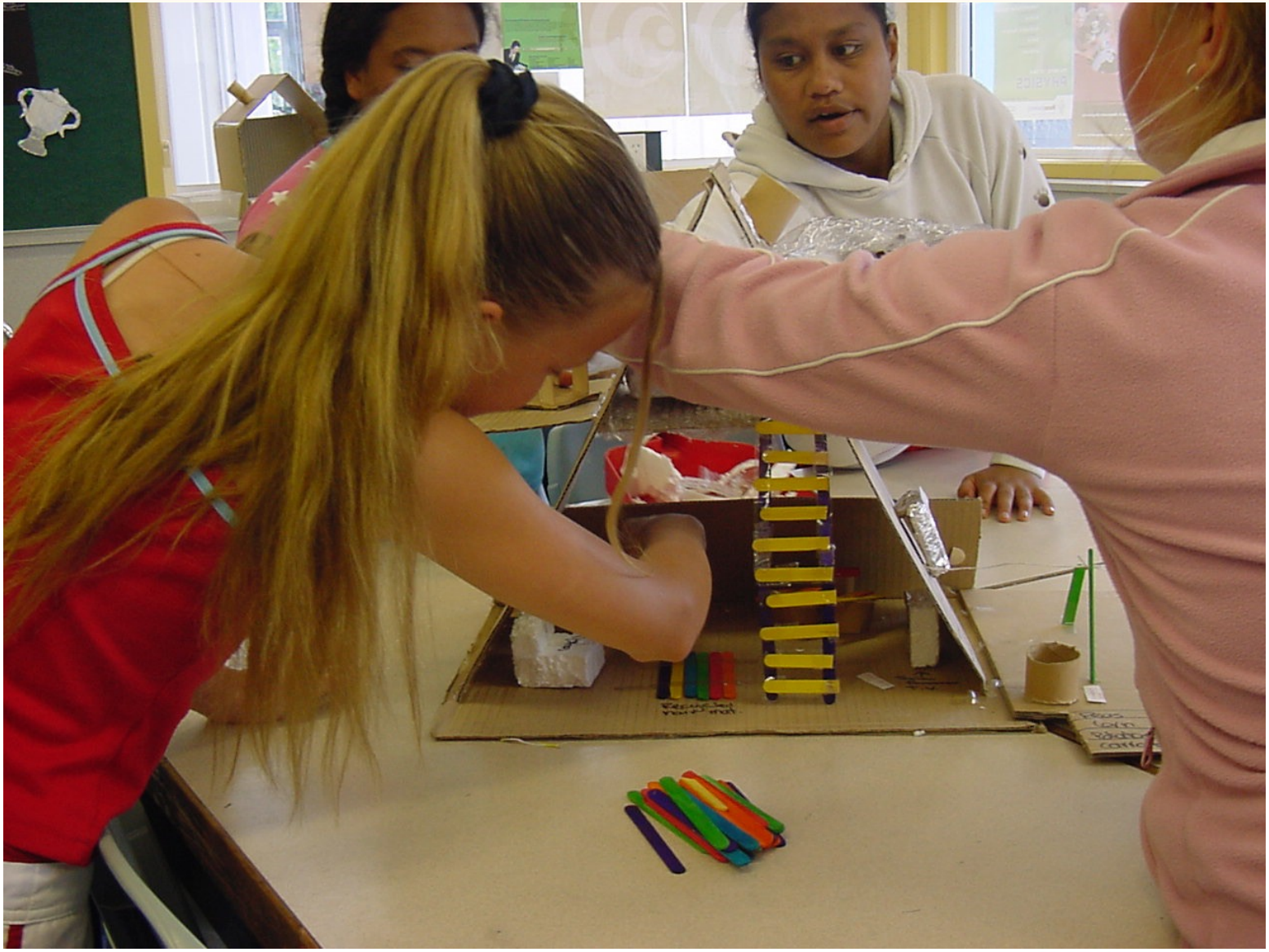
- Diorama construction acted as a common ground through which groups of students **revealed their ideas**, **role played**, **reasoned collaboratively**, and **negotiated agreement about the visual-spatial aspects** of a future oriented scenario.
- Through rendering visual-spatial reasoning, the diorama construction process involved co-representation as groups of students **created, negotiated and refined their characterisations**, and individuals monitored and modified their visual-spatial and associated claims.
- Evidence of **self-monitoring of claims/ideas** as the diorama construction proceeded, as well as collaborative reasoning. There was **complex orchestration** of multimodal representations (3D modelling, drawing, gesture, talk, and written text) involved in the reasoning process.



Key research findings 2

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- Diorama construction helped the meaning making process.
- The **historical perspectives** of town, homes, the local marae and people were ideas prominent in the interviews.
- **Plants**, in terms of diet, and as carbon storers, trees for fuel, and building material held importance.
- **Public transport** vs the need of a car was discussed.
- Food requirements-**meat vs plant** diets
- **Scale** of trees, houses, tree species.
- Design of **house and garden** was a focus.
- Life cycles of animals and plants, food chains and webs.
- **Joy** of physical construction, manipulation using tools, hands.

Implications

- Students could be further supported to learn how to **interpret, make, co-ordinate and integrate meanings in a range of multimodal representations.**
- Students could show and share claims of futures and sustainable communities much more in secondary classes.
- Perhaps policy changes needed!
- How students **identify and integrate meanings across verbal, visual, scientific and embodied/actional modes** could be further investigated.

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