Appendix A

Types of STEM Integration

Type of integration	Description and example of learning experience
Disciplinary	Students learn the content and skills of different disciplines in separate and independent courses. *Example*: Students undertaking a chemistry course develop their knowledge and skills in chemical analysis by undertaking a set of analyses used to measure water quality.
Multidisciplinary	Students learn the content and skills of different disciplines in separate courses, but learning is linked through a common theme. *Example*: Teachers of courses in geography and chemistry utilize a common theme of catchment management to develop students' understanding of the causes of soil erosion (geography) and the impact of soil erosion on water quality (chemistry).
Interdisciplinary	Teachers organize the curriculum around common learning across disciplines. The disciplinary concepts and skills become interconnected, and the lines between disciplines become more blurred. *Example*: Teachers of plant science, chemistry, and geography courses organize their respective curricula around the impact of riparian zones on water quality, setting activities such as undertaking transects to determine plant species and density in a riparian zone (plant science), analyzing water quality of a stream (chemistry), and establishing methodology for assessing erosion (geography).
Transdisciplinary	The most advanced level of teaching and learning of STEM, this type is commonly implemented in the form of problem-based or project-based learning. Throughout a transdisciplinary experience, students apply their knowledge and skills in several different areas, often to carry out a project. *Example*: An activity would be an extension of the above interdisciplinary example, with students in an environmental course undertaking revegetation of a riparian zone. The students draw on their learning in disciplines such as plant science (to decide on appropriate plants for revegetation), geography (to understand and minimize potential erosion from the revegetation process), chemistry (to measure impact on water quality), and business studies (to formulate a budget and seek funding from environmental funds).

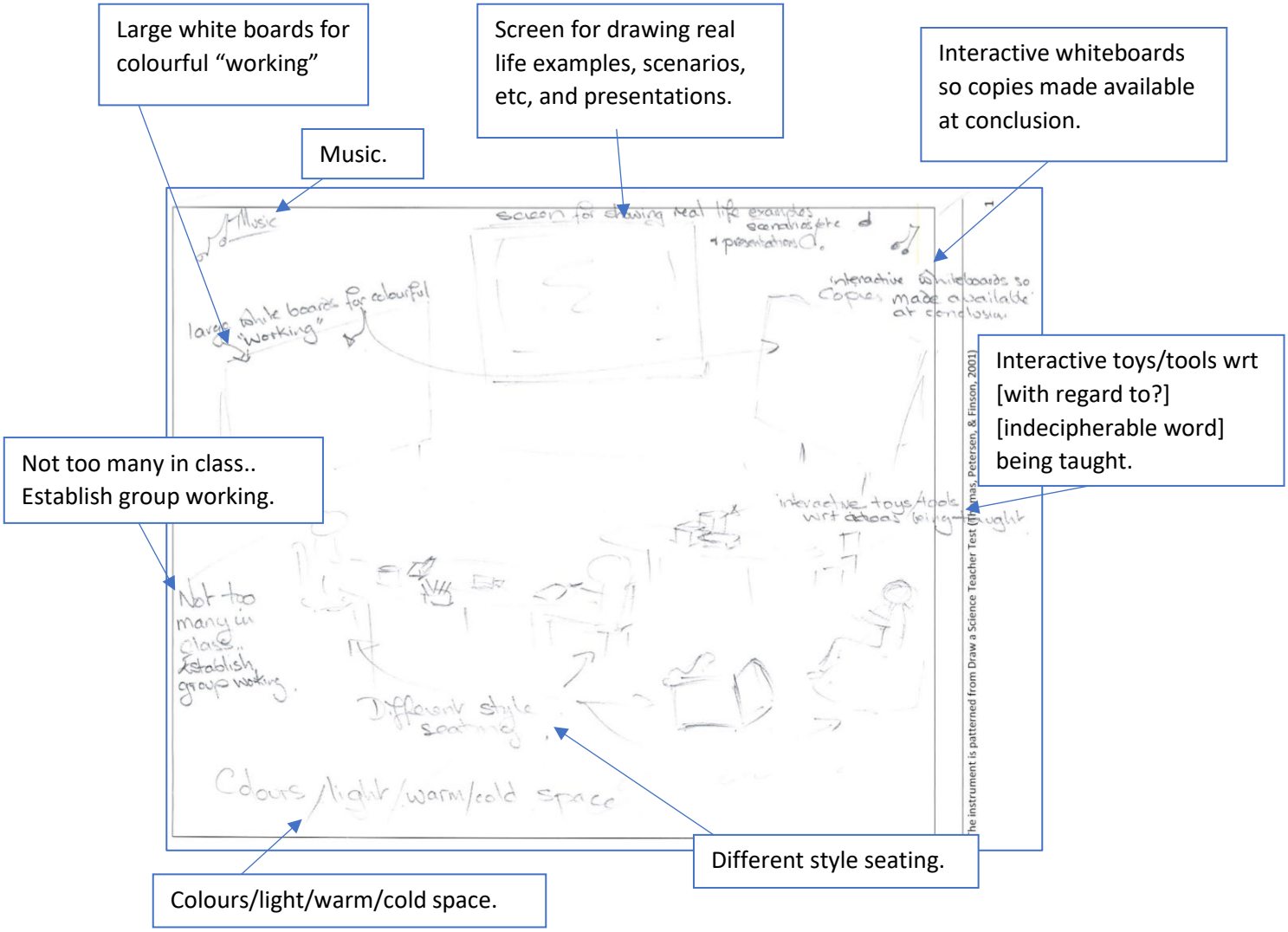
Source. Adapted from Vasquez (2014).

Reference

Vasquez, J. (2014). STEM: Beyond the acronym. *Educational Leadership*, *72*(4), 10–15.

Appendix B

Example of a Student's (P1) D-STEM Response Emphasizing the Physical Learning Environment and Generic Pedagogy

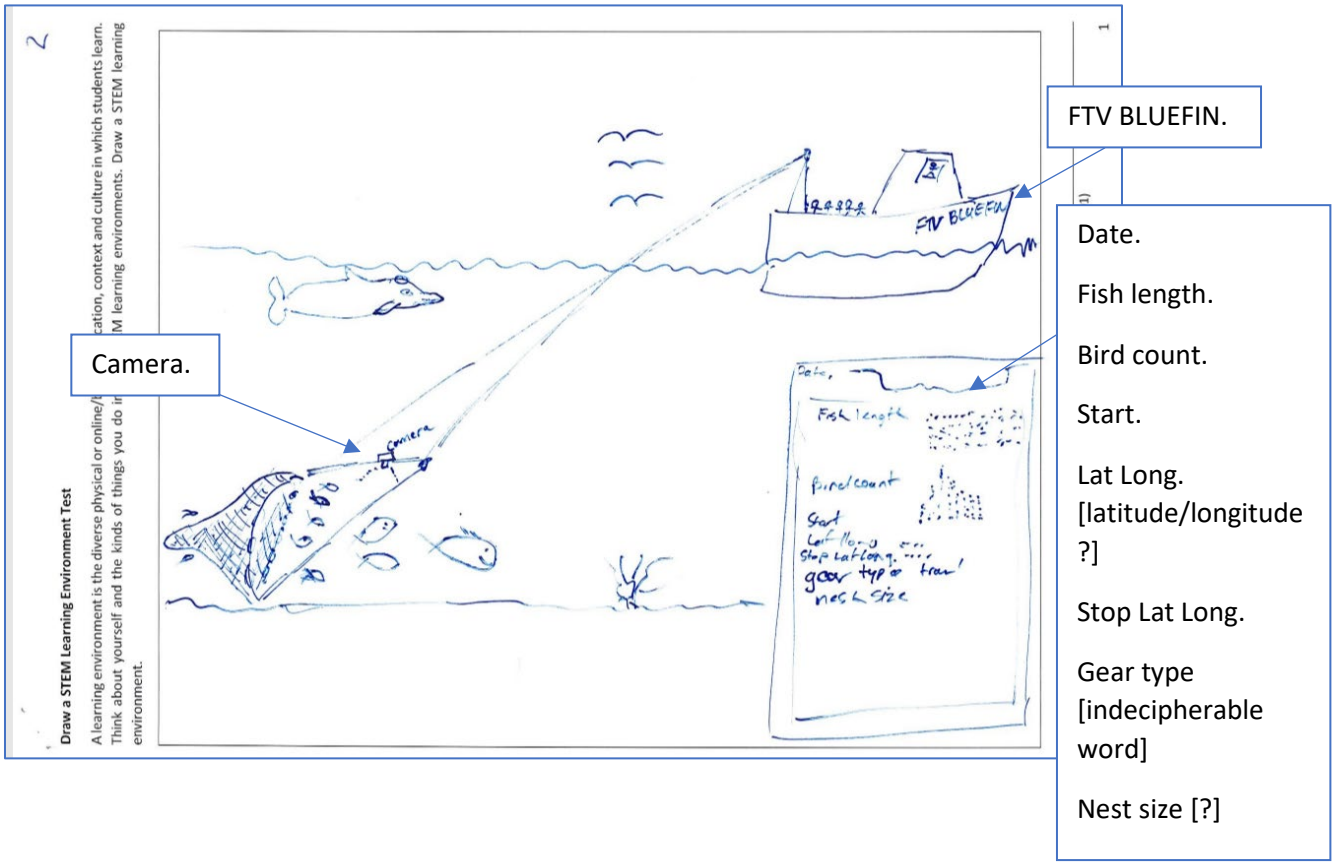


Primarily Maths education

- Comfortable, homely, light and airy environment.
- Food/drinks available to aid with building co-operative group which is supportive of all and making mistakes OK.
- Interactive materials to demonstrate concepts in hands on activities – both teacher and students to use (varies with concept being taught).
- Use of colour and sound to supplement presentations (not just pen and paper).
- Plenty of boards to present material in written form/access by teachers and students). Copies available at end of session.
- Time out to reflect, interact and question prior to regroup.

Appendix C

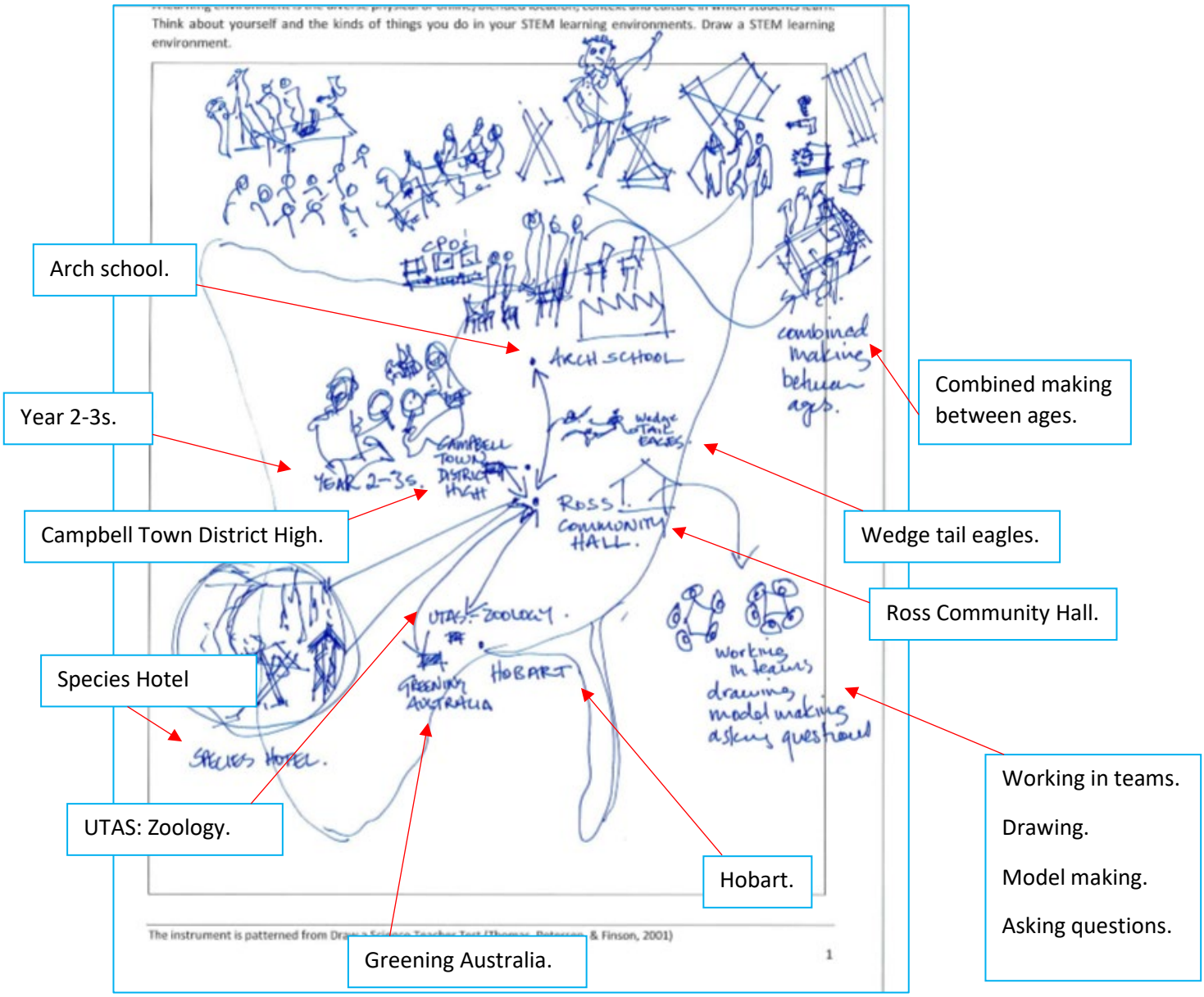
Example of a Student's (P2) D-STEM Response Emphasizing a Transdisciplinary Approach to Measuring and Reducing Fish Bycatch



This is the fisheries training vessel (FTV) BLUEFIN. With capacity to hold 18 students, 2 Academics and 6 crew at sea for 5 days, to teach fisheries management concepts and environmental issues. In the diagram there are multiple fish cohorts, with variable abundance. Small fish escaping the gear. Cameras to film fish behaviour. 3 escape. When hauled data is collected on wildlife interactions and the biological measurements of the catch, this is an experiential learning environment that imparts deep learning.

Appendix D

Example of a Student's (P8) D-STEM Response Emphasizing a Transdisciplinary Approach to the Conservation of Wedge-Tailed Eagles



Collaborations across generations – where everyone is sharing, proposing, testing, discussing from drawings, prototypes and real 1:1 objects.

Can review visit/photograph [the real 1:1 objects].

Many sites… many voices. Children/uni students/Phd students/ecologist/scientist/artists/designers.