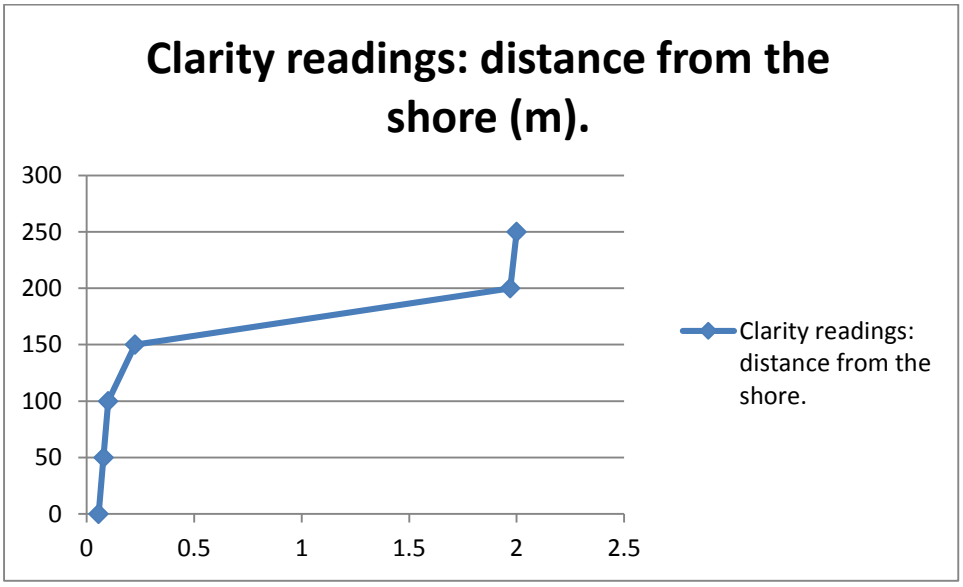
Note: This student also described a valid method, correctly identified key variables and processed raw data.

Purpose: To observe the clarity of sea water off the mouth of the Aparima River following a minor flood that introduced clay into the river and the sea. Clarity will be recorded using a secchi disc on the end of a two metre pole. Readings will be taken on each side of a boat.

Hypothesis: The further the river water travels into Foveaux Strait the clearer the water readings will be.

Results:

Straight line distance from the shore.	0m River mouth	50m	100m	150m	200m	250m
Secchi Reading 1 Right side	0.06m	0.075m	0.095m	0.20m	1.95m	>2.0m
Secchi Reading 2 Left side	0.05m	0.081m	0.096m	0.25m	1.99m	>2.0m
Average	0.055m	0.078m	0.0955	0.225m	1.97m	>2.0m



Interpretation of the data:

The investigation carried out was to establish a pattern of how clay released during a minor flood affected sea water and to find out how far the clay went into the sea water before it had no effect on water clarity. The investigation is a pattern seeking investigation.

The results show that, where the river water met the sea water, initially the clay stayed suspended in the water. As the river water mixed with the sea water there was a drop off in the concentration of clay particles and water clarity started to increase. The drop off was not

uniform and there was only a minor difference between the river mouth and 150m off shore. After this there was a significant increase in clarity between 150m and 200m from shore and by 200m typical water clarity of Foveaux Strait had been achieved. Between 150m and 200m the change was strongly significant. At 150m the clarity was clay-obscured and yet by 200m the water was quite clear. Something happened between these two points to remove the clay particles from the water. One possible reason is that before 100m the seawater and the river water did not mix together and the fresh river water floated upon the sea water. Between 150m and 200m from the shore the waters mixed and the clay disappeared from the field of view. (1)

Earth and Space science behind the investigation:

a/ Water Densities:

When river water and sea water meet there is a vertical layering between the two water bodies. The fresh water rides over the sea water due to differences in density in the water bodies. Fresh water tends to ride over the sea water because it has a lower density. This separation lasts for quite some time or until the waters get mixed due to wave action, ocean currents or ocean bottom irregularities. A future investigation could be to measure salt water concentrations of the surface waters 250m from the shore. This would require collecting surface water samples and testing for salt concentrations. (2)

b/ Flocculation:

Clay particles are suspended in moving water due to their small size and repulsion by water molecules. Clay can stay suspended in water for very long periods of time. However, when clay particles meet calcium they tend to clump together in a process called flocculation. Sea water has a large amount of calcium and as river water and sea water mixes with the calcium causes the clay particles to clump (flocculation) and drop to the sea floor. (3)

Conclusion:

The change in water clarity as a river in minor flood flowed out into Foveaux Strait showed a pattern of a sudden clearing between 100m and 150m off shore. This was due to the waters overcoming density differences and the clay particles being flocculated due to the high level of calcium in the sea water.

The experiment was valid and showed an expected trend in the data. Our hypothesis was correct; however we expected a gradual change not the abrupt change we got from our readings. This shows that river waters and their suspended sediments stay separate until the waters are mixed and the calcium in the sea can flocculate the lumps of clay. The data was reliable as we took our reading accurately and had a group consensus of the readings. (1)