

Making mathematics meaningful: an investigation into middle years students engagement with problem based learning

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Tension

- “[M]athematics ... is perceived to be ‘hard’, ‘boring’ and ‘useless’” (Brown, Brown, & Bidy, 2008)
- “Students formulate and solve problems when they use mathematics to represent unfamiliar or meaningful situations” (ACARA, 2011).

Knowledge Producing Schools

- Project based learning
- Students formulate and solve a problem or issue in their local community
- Students not only ‘consume’ knowledge but also *produce* new knowledge that benefits others (Bigum & Rowan, 2009)
- Students “produce some kind of product ... that can be externally validated and which thus forms a bridge between school and not-school.” (McGrath & Rowan, 2012, p.69)

Authentic pedagogy

- Students' "accomplishments ... are significant, worthwhile and meaningful" (p. 1).
- Classroom instruction requires higher-order thinking, substantive conversations, deep knowledge and connections to the world beyond the classroom.
- Task or problem must be connected to the real world and be for an audience beyond the school (Newman et al. 1995).

This study

- Research question
 - How did the students use mathematics meaningfully to make a difference in their local community?
- Participants
 - 27 students Years 5 to 9 regional school and teacher
 - External experts (community youth development officer, YAS project manager, researcher/mathematician)
- Data
 - My journal observations and reflections
 - Audiotaped interviews - students and external experts
 - Copies and photographs of student work
 - Videos of some sessions
- Analysis - working mathematically moments
 - problem negotiation, formulation, solving, communication

Their problem

- To create a teenage safe space
 - that was family friendly
 - included multicultural artwork that represented the community
 - had a landscaping and design element.
- To encourage a wide range of people to use the park as a meeting place
- To make an actual difference in their local community.

Problem negotiation

- Initial task was location of the Youth Activity Space
- Council's aim was a skate park
- But students did not feel safe in either adjoining park
- Surveyed everyone from year 5 – 12 in the two schools
- Develop a survey

Problem formulation

- The CYDO: “[T]hey are the experts in what young people want. ... Young people had identified what they wanted in the space ... a space inclusive of all young people ... Council wanted a recreation space ... young people wanted more than that - the social aspect. ... I think it just came out.”

Survey

2. Which of the following helped you choose the location for the Nambour Youth Activity Space (if any)?

- | | |
|---|--|
| <input type="checkbox"/> I like the current location | <input type="checkbox"/> It's a safer space |
| <input type="checkbox"/> It's easier to get to | <input type="checkbox"/> It's a family friendly space |
| <input type="checkbox"/> It's closer to town | <input type="checkbox"/> Privacy |
| <input type="checkbox"/> It's closer to amenities e.g. public toilets | <input type="checkbox"/> More opportunities for youth activities |

5. How would you use the Nambour Youth Activity Space?

- | | |
|--|--|
| <input type="checkbox"/> Skateboarding | <input type="checkbox"/> Meeting and hanging out with friends and family |
| <input type="checkbox"/> Bike riding | <input type="checkbox"/> Picnic / BBQ / eating |
| <input type="checkbox"/> Scooting | <input type="checkbox"/> Sport and recreation activities |
| <input type="checkbox"/> Entertainment | |

6. Other than a skate park, what else would you like included in the Nambour Youth Activity Space?

- | | |
|--|---|
| <input type="checkbox"/> Art wall or spaces | <input type="checkbox"/> Picnic / BBQ / eating area |
| <input type="checkbox"/> Children's play area | <input type="checkbox"/> Public toilets |
| <input type="checkbox"/> Drink fountains | <input type="checkbox"/> Shade / Shelter areas |
| <input type="checkbox"/> Fitness equipment | <input type="checkbox"/> Stage for entertainment |
| <input type="checkbox"/> Grassed areas and gardens | <input type="checkbox"/> Tables and seating |

Solution

What students would use the skate park for.

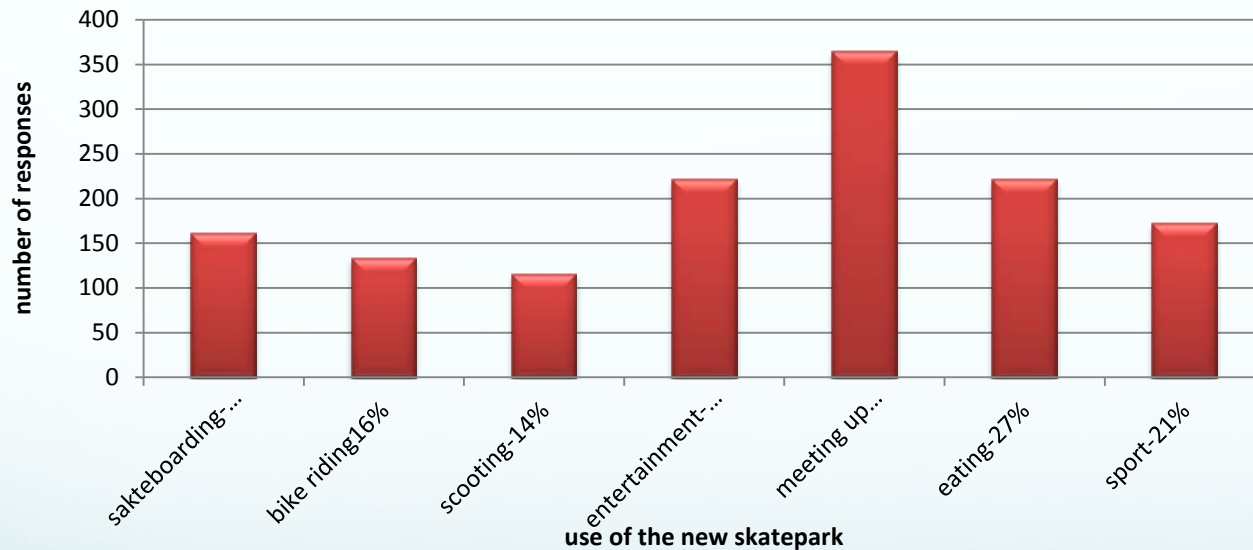


Figure 2. The graph shows how the students would use the Nambour Youth Activity Space.

Demographic group

- Compared the demographics of their sample with the data from the ABS website
 - Graphically
 - Using percentages
- “I worked on the demographic analysis. One of the things I learnt was how to work with percentages. How to calculate them from just ordinary numbers.” (high achieving Year 9 student)
- They need to consider the percentages in the context they are working in (White & Mitchelmore, 2005).

Communicating

- Report to Council

Project beyond Limits report

Nambour Youth Activity Space

Youth community engagement 2012



Completed by Nambour State High School and
Nambour State School

Community outcome

- Students' preferred site chosen
- The Council project manager's reaction: "The kids got it over the line. Things were very fiery in Council with the Business Alliance. ... It was the kids report and graphs that got the decision over the line."

Students' learning outcome

- Opportunities for correction of misconceptions with mean, median and mode
- Deeper understanding of percentages in context
- Saw first hand
 - the meaningful useful of mathematics
 - The importance of being able to use mathematics to communicate findings
- Opportunities for further learning

Students' final words

- “During PBL I have learnt many skills like, how to work in a team with many people from different age groups. This has helped learn how to use other people’s skills. It is also very good and I learnt many things on the computer, such as graphing and how to analyse certain questions like in the report that we did and it’s a very fun experience and I’ve learnt many things.” year 8
- “I enjoyed PBL because we actually got to do something useful in the community instead of just doing maths sitting in the classroom. We could actually go out there and design a skate park or something awesome.” year 6