

Introduction

My intention with this research was to investigate structures that I could use to improve the development of student projects. I was hoping to improve the complexity of self-directed student work, in particular an increase in the number of novel concepts included in the finished product and a genuine refinement of ideas throughout the process.

I chose peer feedback as a possible method for improving student projects. Ron Berger's *An Ethic of Excellence* (Berger, 2003) outlines a protocol for providing peer feedback in a project-based learning (PBL) context. Much else has been written about the effectiveness of peer feedback in PBL but my research focusses on its application in a Maker Learning environment. Maker Learning is distinct from PBL in that it is driven by questions generated by students rather than those imposed from outside (Martinez and Stager, 2013).

I investigated several methods of structured peer feedback and also observed the role that unstructured peer feedback (incidental classroom interactions) had on the development of student projects.

The Research Question

How can structured peer feedback improve the complexity of Grade 10 boys' robotics projects?

Research Context

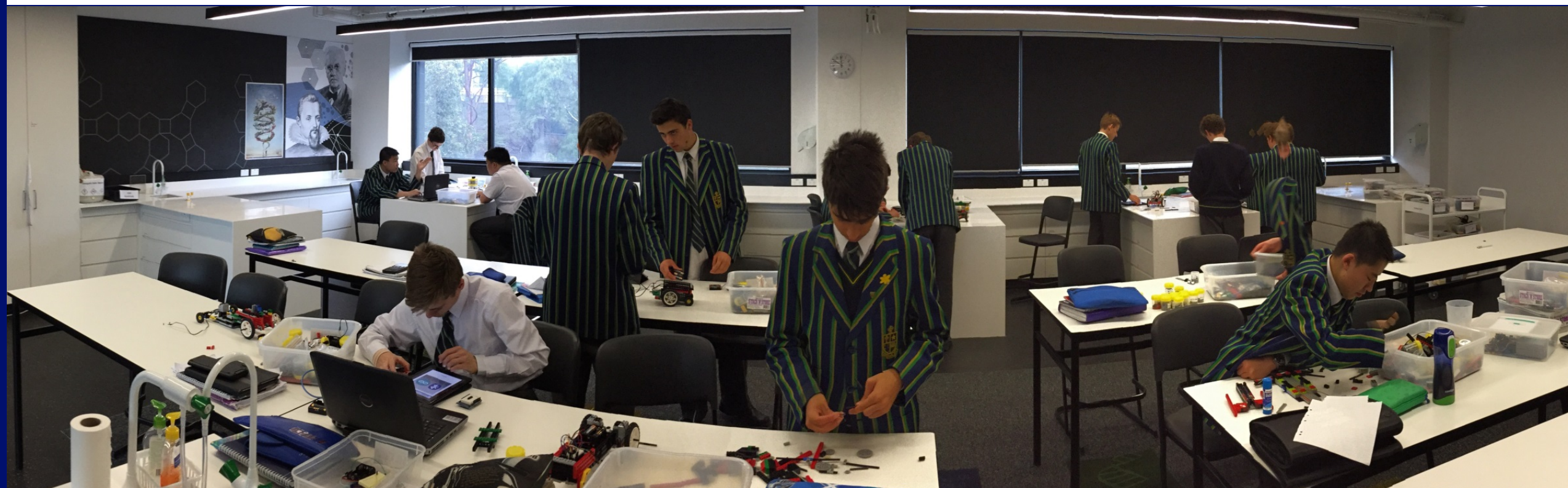
St Kevin's College is a Catholic Boys Day School in the Edmund Rice tradition. It educates boys from pre-school to Grade 12 and has a proud tradition of academic and sporting success.

"I know of people who gave tips to other classes in exchange for cookies. There was a black market for coding!"

Participants

My research was conducted with Grade 10 Mechatronics students. These boys are 15-16 years old and have elected to study the subject based on their interest in computers, electronics and robotics.

Over the semester the boys study the basics of electronics and mechanics and conclude with their choice of project which they work on over several weeks.



The Research Action

Students worked on a four-five week project building anything of their choice that included both hardware and software.

Structured peer feedback took the form of:

- Presentation to the class followed by questions and answers
- Students grading each other's work using rubrics
- The publication of photos and descriptions to the class intranet page and subsequent online discussion

Unstructured peer feedback occurred without teacher intervention as students sought and offered assistance and advice within the class.

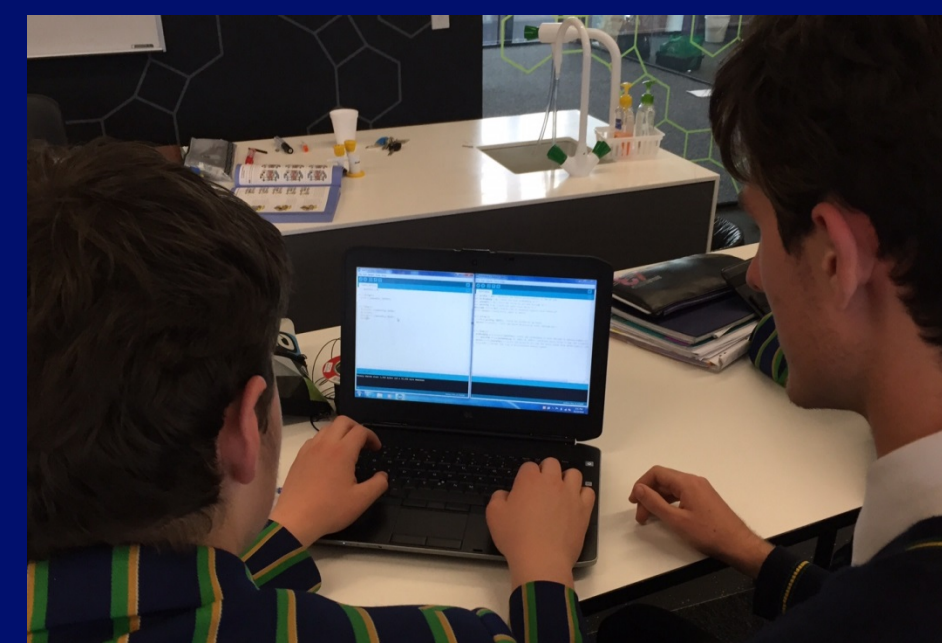
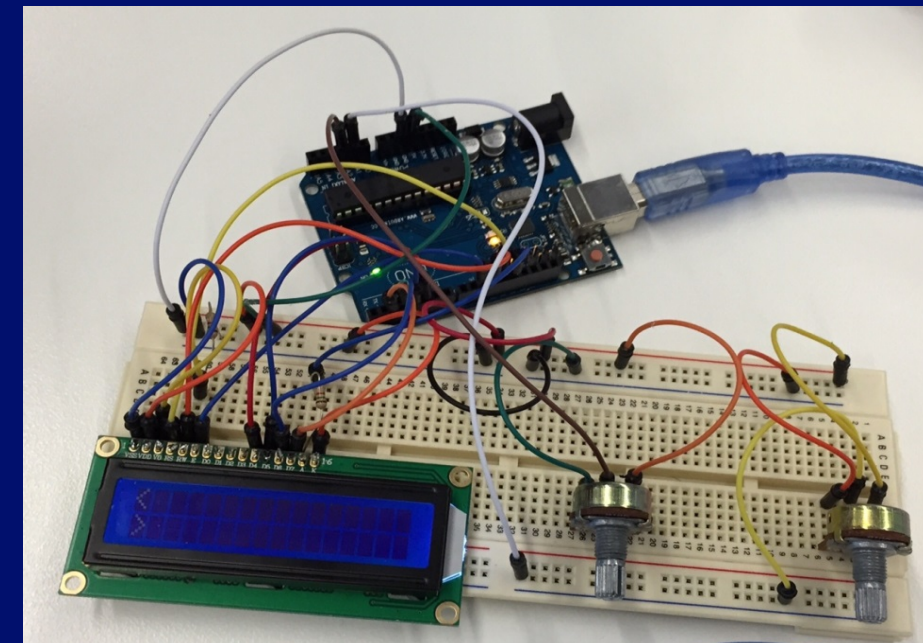
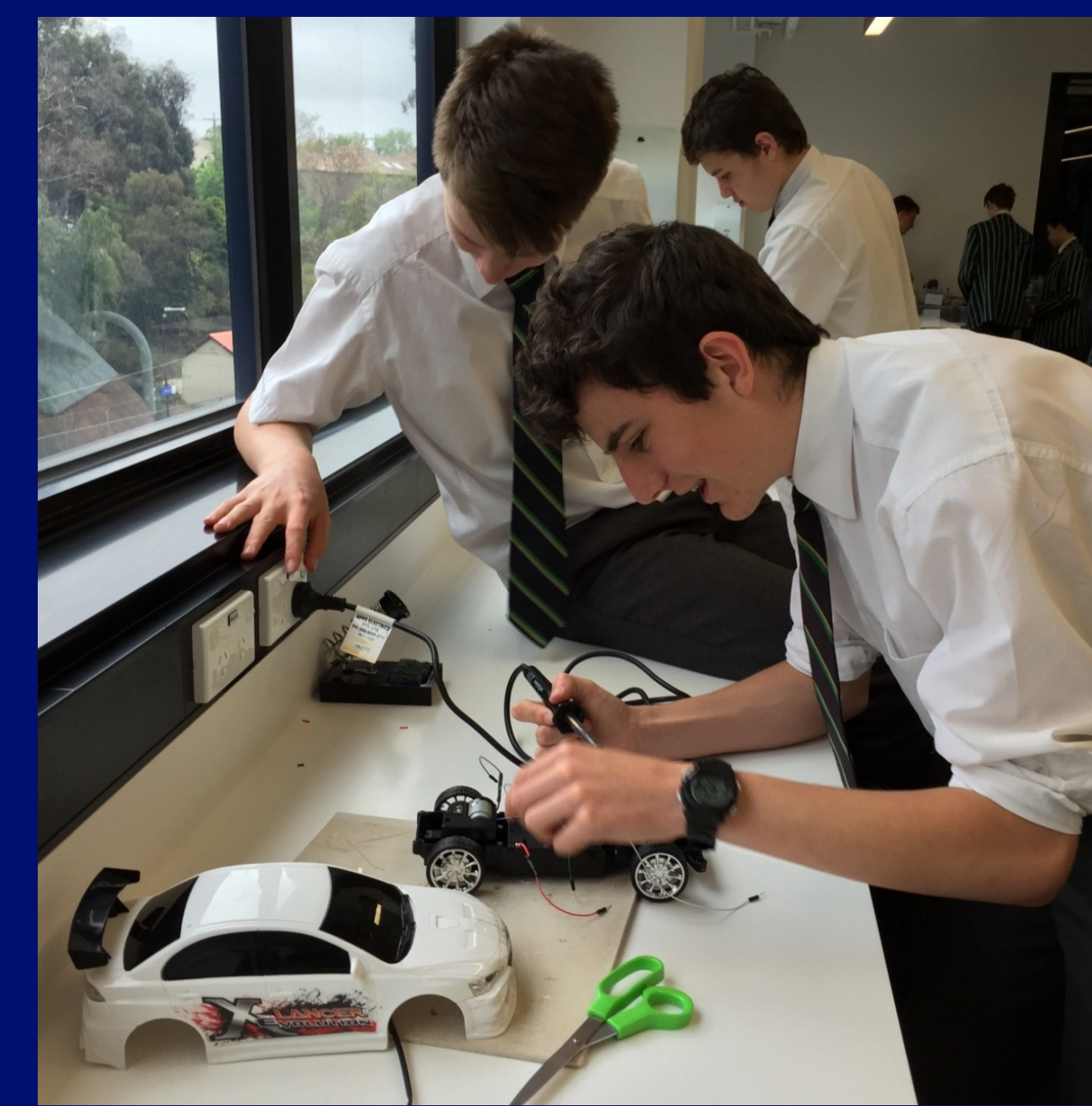
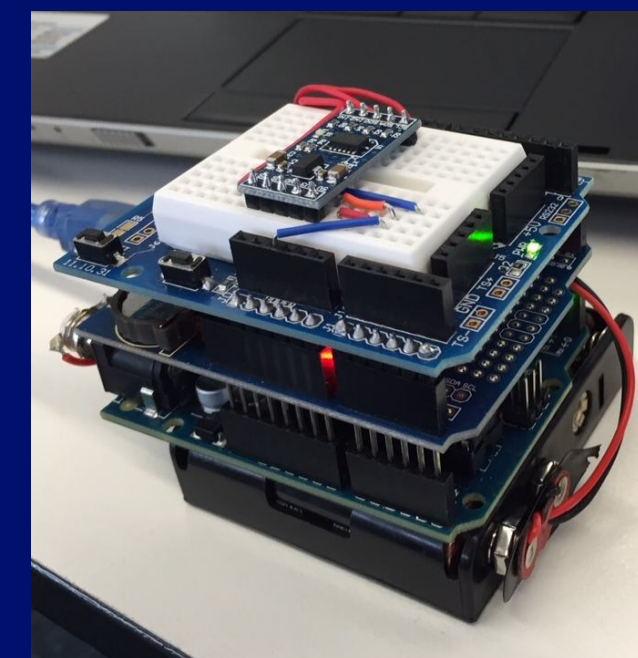
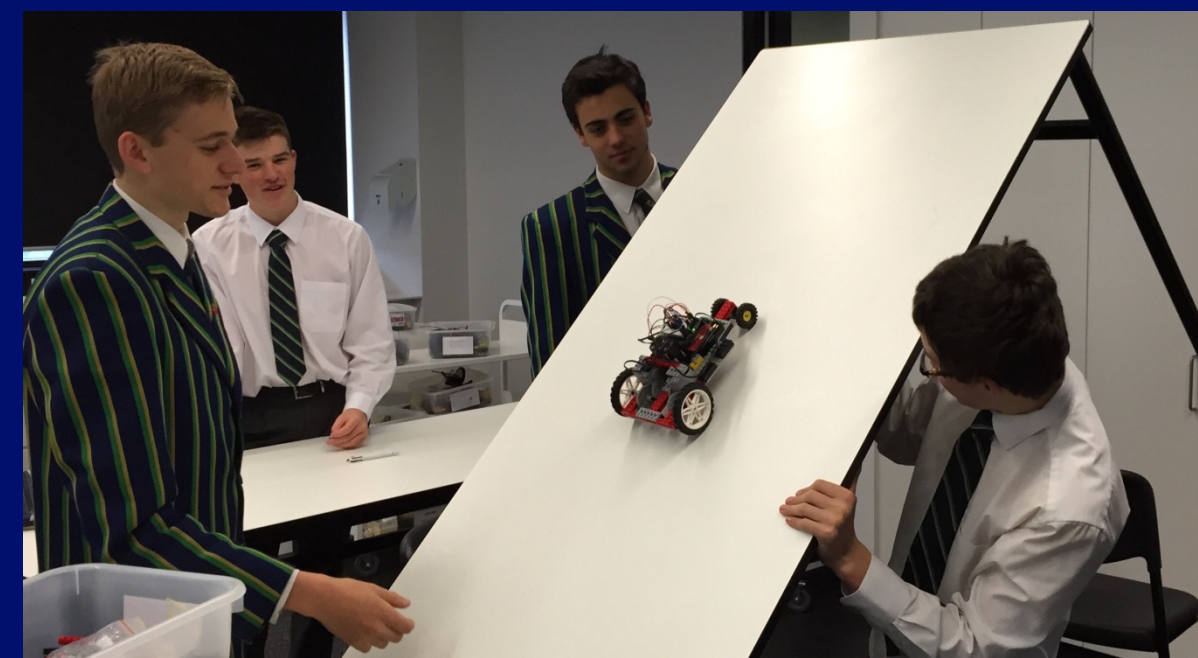
Data Collection

I used the following methods to collect data:

- Observations during class time, photos, videos and short discussions
- Post-project interview, completed as a group discussion
- Post-project survey, completed electronically as individuals

Data Analysis

The group interview was transcribed and thematically analysed. Quotes were collated and compared to quantitative data from the survey. I also included my own reflections and observations of student progress and the quality of their finished products.



Key Findings and Discussion

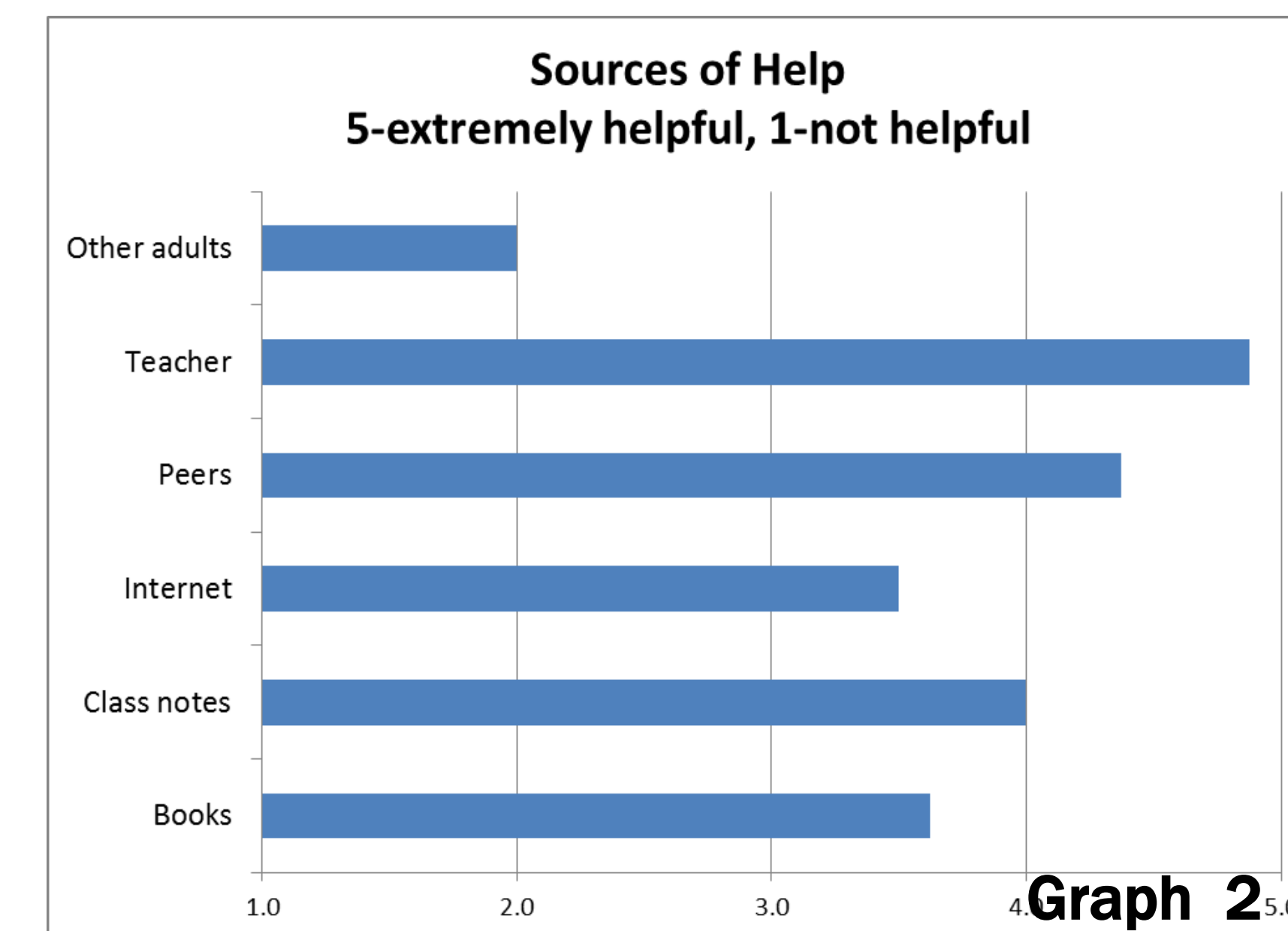
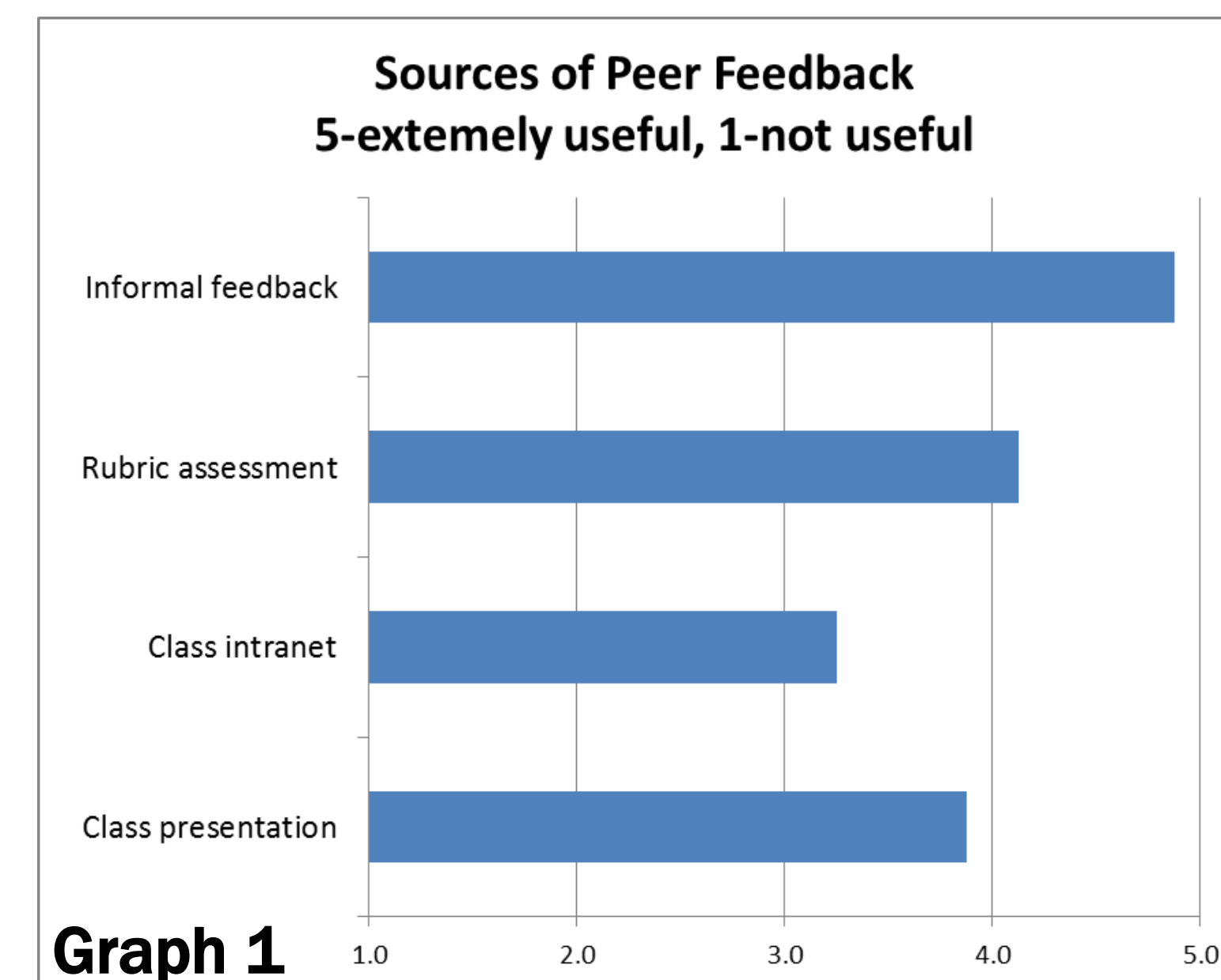
- The structured peer feedback was useful to varying degrees. The results of the survey in Graph 1 echo comments from the interview that the rubric assessment was the most useful, mainly because it helped keep them orientated to the requirements of the task.

"When we saw the rubric ...we realized we could use our time much more efficiently..."

- The unstructured peer feedback was the most useful. This consisted of advice and the sharing of ideas (rack-and-pinion steering was one example) or technical assistance with the operation of power tools or soldering irons.

"I reckon people in the class, people just helped other people. ... Everyone just helping everyone..."

- Their teacher was the most useful, with their peers a close second. Graph 2 shows peer feedback in relation to other sources of help.



Conclusions

- Structured mechanisms for peer feedback were less effective at increasing complexity than the informal sharing of advice, ideas and assistance that grew within the classroom.

- Where structured peer feedback is useful is when it is *highly* structured, with interview questions or a rubric.

- Students completing similar, PBL-style projects (LEGO vehicles) found structured peer feedback moderately useful.

- Students completing more diverse Maker Learning-style projects found structured peer feedback less useful but still exchanged skills-based assistance.

- My results further underline the importance of relationships in boys' education, but in this case between students in the class as well as between student and teacher.

- Teachers have a vital role in fostering a supportive, collegiate environment where expertise is celebrated and shared and where students feel safe in asking each other for help and offering opinions.

"If we just had our group working in isolation without anyone else, I think it would have turned out really, really differently to how it did."

"Harry's group did the rack-and-pinion steering and so we took inspiration from that ... and he helped me out putting it together."

Key Readings

Barron, JS. (1998). Doing with understanding: Lessons from Research on Problem- and Project-Based Learning. *The Journal of the Learning Sciences*, 7(3&4), 271-311.

Berger, R. (2003). *An ethic of excellence. Building a culture of craftsmanship with students*. Portsmouth, NH: Heinemann.

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Keddie, A. & Mills, M. (2007). *Teaching Boys. Developing classroom practices that work*. Crow's Nest: Allen and Unwin.

Martinez, S. L. & Stager, G. (2013). *Invent to learn. Making tinkering and engineering in the classroom*. Torrence, CA: Constructing Modern Knowledge Press.

Reichert, M. & Hawley, R. (2010). *Reaching boys, teaching boys. Strategies that work and why*. San Francisco: Jossey-Bass.

Further Information

This poster and further information are available at <http://www.theibsc.org/>.

Details of this research are available at <http://rbellibsc.edublogs.org/>

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