Science Challenge

a science-based language learning project for junior engineers at Kochi National College of Technology

Michael Sharpe  sharpemike1970@gmail.com

Background

Kochi National College of Technology (KCT) is one of the 63 junior engineering colleges (*koutousenmongakko)* that were established in Japan during the mid-1960s. Students spend five years at KCT beginning at age 15, during which time they have specialist education in one of five fields of engineering (mechanical, civil, electrical/IS, materials) in addition to regular academic subjects.

English language education at KCT

- Similar to a regular Japanese high school, i.e primarily focused on grammar/translation, although communication skills and extensive reading courses are now offered.

Rationales for introducing *Science Challenge* as an addition to the regular L2 curriculum

- General: Need for improved L2 communicative competence throughout the Japanese engineering profession, and for KCT to achieve its stated goal - 'to train international engineers'.
- Specific: Desire to introduce practical L2 learning activities that will provide motivation for and promote interest in language learning among KCT students from an early age.

Principal syllabus design criteria

- Task-based learning design for mixed groups of 10 mechanical and electrical engineering students, 3 x 100 mins classroom sessions.
- 100% of content delivery in English
- Project theme related to dynamics
- Opportunities for practice in all four macro-skills, with main focus on speaking skills.

Observations and outcomes

Pros ✓

- Small group provides excellent opportunities for informal interaction between instructor and learners.
- Based on feedback from students, the course has provided a motivating learning experience - important at an age when many Japanese students begin to lose their motivation for language learning.
- Content related to student's subject areas and areas of interest introduces a purposeful element into language learning.

Cons ✗

- Construction phase is time-consuming.
- Tendency for some students to be excluded from the process.
- Time schedule means there is no opportunity to provide learners with face-to-face feedback on their final reports.

Planned modifications for the 2014 academic year.

- Provide learners with a choice of three projects - catapult, solar car and spaghetti bridge
- 'Interview' each group at the end of each stage, eliciting information about key features of their design, construction techniques and so forth.
- Schedule more time for feedback.

Science Challenge - syllabus outline

Instructor provides background information, outlines language learning objectives and design brief - *to design and construct a machine that can launch a ball over a 1 metre high barrier at the maximum possible distance*

Students are asked to look over the provided materials and then discuss and plan a suitable design in groups, with input from the instructor.

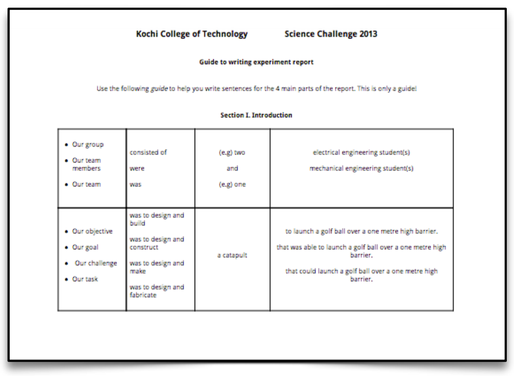
Students test, modify and finally assess the performance of their machines in a head-to-head competition.

Students collaborate to produce a report styled after a basic experimental report,using the guide seen on the right.

Notes

- All necessary materials are supplied by the college

Appendix: Excerpt from student writing guide and sample report



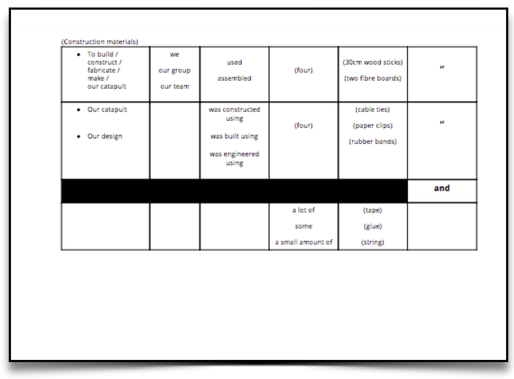
Kochi College of Technology **Science Challenge 2013**

Guide to writing experiment report

Use the following *guide* to help you write sentences for the 4 main parts of the report. This is only a guide!

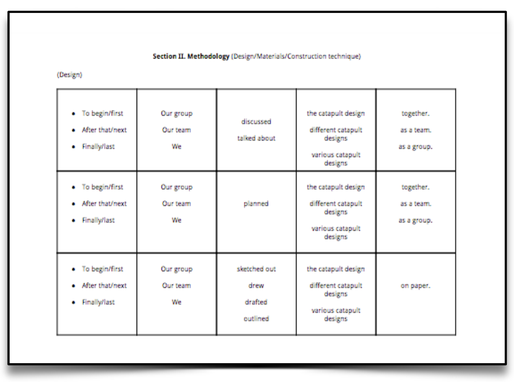
Section I. Introduction

• Our group • Our team members • Our team	consisted of were was	(e.g) two and (e.g) one	electrical engineering student(s) mechanical engineering student(s)
• Our objective • Our goal • Our challenge • Our task	was to design and build was to design and construct was to design and make was to design and fabricate	a catapult	to launch a golf ball over a one metre high barrier. that was able to launch a golf ball over a one metre high barrier. that could launch a golf ball over a one metre high barrier.



(Construction materials)

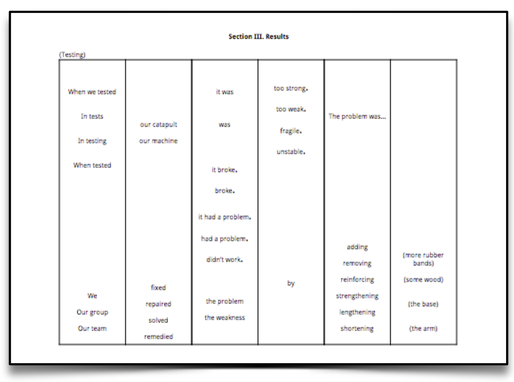
• To build / construct / fabricate / make / our catapult	we our group our team	used assembled	(four)	(30cm wood sticks) (two fibre boards)	"
• Our catapult • Our design		was constructed using was built using was engineered using	(four)	(cable ties) (paper clips) (rubber bands)	"
					and
			a lot of some a small amount of	(tape) (glue) (string)	



Section II. Methodology (Design/Materials/Construction technique)

(Design)

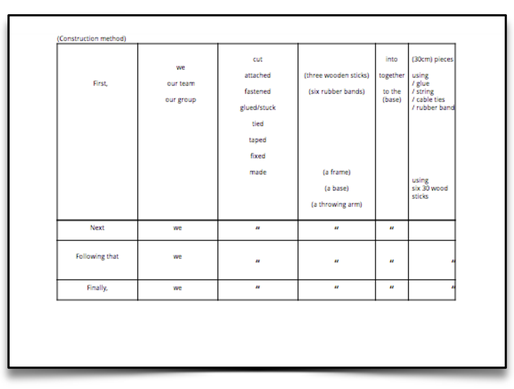
• To begin/first • After that/next • Finally/last	Our group Our team We	discussed talked about	the catapult design different catapult designs various catapult designs	together. as a team. as a group.
• To begin/first • After that/next • Finally/last	Our group Our team We	planned	the catapult design different catapult designs various catapult designs	together. as a team. as a group.
• To begin/first • After that/next • Finally/last	Our group Our team We	sketched out drew drafted outlined	the catapult design different catapult designs various catapult designs	on paper.



Section III. Results

(Testing)

When we tested In tests In testing When tested	our catapult our machine	it was was	too strong, too weak, fragile, unstable,	The problem was...	
We Our group Our team	fixed repaired solved remedied	it broke, broke, it had a problem, had a problem, didn't work, the problem the weakness	by	adding removing reinforcing strengthening lengthening shortening	(more rubber bands) (some wood) (the base) (the arm)



(Construction method)

First,	we our team our group	cut attached fastened glued/stuck tied taped fixed made	(three wooden sticks) (six rubber bands) (a frame) (a base) (a throwing arm)	into together to the (base)	(30cm) pieces using / glue / string / cable ties / rubber band using six 30 wood sticks
Next	we	"	"	"	
Following that	we	"	"	"	"
Finally,	we	"	"	"	"

Example of student's written report:

Introduction

"Our group consisted of three electrical engineering students. Our objective was to build a machine capable of launching a ball over a one-metre high barrier.

Design and construction

To begin our group discussed the design together. Next we sketched the design on paper.
To build our machine, we used ten 30cm wood sticks, 15 cable ties, a 30 x 30cm piece of fibre board, some tape, glue and many rubber bands.

To construct our machine, first we made a base from fibre board. Next we made a frame. First we made two triangle shapes using wood sticks and cable ties. Then we joined the two frames together using cable ties. Then we attached the frame to the base. Finally we made a throwing arm and we attached the arm to the frame and added some rubber bands.

Results

When we tested our machine it did not have enough power. We fixed the problem by adding some more rubber bands. In the competition we launched the ball a maximum distance of 8m.

Conclusion

Our design had enough strength and stability, but did not have enough power. Our team should have used more rubber bands. These results show that the most important part of a catapult design is power."

Further information: Sharpe, M. (2014). Science Challenge. A novel language learning project at Kochi National College of Technology. *Annual Report of the JACET ESP SIG*

Links: Online resources for science projects

www.nasaexplores.com www.sciencefair-projects.org/
www.education.com/science-fair/ www.sciencebob.com/experiments/

Kochi National College of Technology Japanese