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# Land Yachts: Building active online collaboration

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**Abstract:** *It is now more than two decades since Sendov (1986) asked “how do we build education in the presence of the computer” (p. 16). The question is perennial – almost rhetorical – and it has remained without a definitive answer despite our rethinking “education” in terms of collaborative approaches and our replacing the naïve notion of the standalone “computer” with newer interactive technologies. The Land Yachts project, conducted in 2007, attempted to answer Sendov’s question in terms of Web 2.0 connectivity – here blogs, and photo and video uploads – and to use the functionality of these tools to change “education” to be less about a single classroom and more about collective knowledge building. The project, through the Oz-Teachernet, involved 477 children in 16 schools across Australia. In teams, they built small wheeled vehicles from recycled materials and, powered by an electric fan, tried to make them travel as far as possible on a “track.” They contributed to a blog and posted images and details of their designs to a shared online space. This paper will use published project interactions to draw conclusions about active online collaboration between students, teachers and the oz-Teachernet group.*

The oz-Teachernet [<http://www.oz-teachernet.edu.au>] is a non-profit community group based in the Faculty of Education at QUT. It has been in operation since 1995 and, during that time, has scaffolded online curriculum projects and hosted successful professional email lists. This paper will describe and present findings from our most recent project, *Land Yachts*. The project endeavoured to answer to Sendov’s (1986) question which asked “how do we build education in the presence of the computer” (p. 16). The guiding aims were:

- a. to make effective use of the Web 2.0 tools built into the revamped oz-Teachernet website (released April 1, 2007);
- b. to enact distributed constructionist principles of learning (after Resnick, 1996) and notions of “hard fun” (after Papert, n.d) on which the oz-Teachernet is built;
- c. to encourage scientific, mathematical and technological problem-solving through real-world design processes;
- d. to encourage the development of ICT literacy defined by the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) as the ability of individuals to use ICT appropriately to access, manage, integrate and evaluate information, develop new understandings, and communicate with others in order to participate effectively in society (MCEETYA, 2005); and,
- e. to facilitate active collaboration between students, teachers and the oz-Teachernet group.

The Land Yachts project had been suggested by a teacher on the oz-teachers mailing list during 2006 (MacAninch, 2006, November 16) and the oz-Teachernet group realised its potential as a new online curriculum project for our community. This new project, based on small wheeled vehicles made from recycled materials and propelled by an electric fan across a floor or other hard surface (see Figure 1), gave impetus and direction to the development of the new website through the need for robust permissions, password authentication and file upload processes.

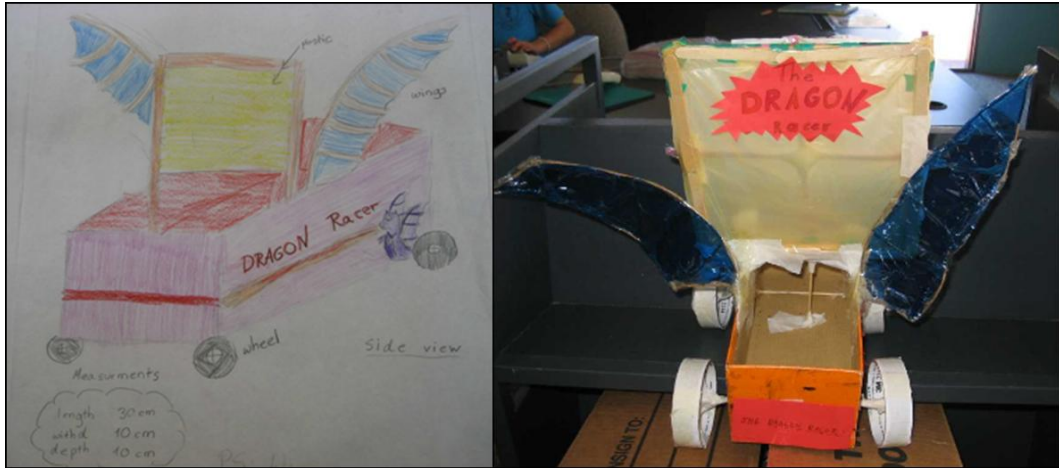


Figure 1: Example of a Land Yacht “The Dragon Racer”

Invitations were sent out through the oz-teachers and other mailing lists and responses were received from schools across Australia. When the project began in Term 3, 2007, it was with 16 schools, 477 students (in 143 teams) and 18 teachers actively taking part. The schools were from locations as diverse as Far North Queensland and Western Australia and represented a mixture of state and independent schools. A teachers’ email list was established, site access was given and “how to” instructions regarding website contributions and uploads were developed and distributed. A sample team page was built to act as a model for student contributions.

The project ran over six weeks culminating in a “race day.” The project was not competitive and all students received a certificate of participation. Interaction on the website – which was password protected to secure student safety – was active and was a critical part of the project. Each team ( $N=143$ ) had its own page. These were generated automatically and presented as a blank template (see Figure 2). Students were invited to give their team and their yacht an original name and spaces were provided for *Team Details*, *Design Notes*, *Team Results* and *Blogs*.

Figure 2: Land Yachts Template

The following discussion will present findings from the project using the fields from the team's pages (Figure 2). Open coding (Glaser & Strauss, 1967) has been used to analyse the text within the posted Design Notes, Comments (Team Results) and Blog entries. This process allows the categories to emerge from the data which, in this instance, were generated after sorting through student and teacher postings to determine common themes.

### Naming the Land Yacht

Original names appeared including The Scary Scarred Scurvy Sailing Ship, S.S. Jellyfish and Sonic Lama with frequent allusions to contemporary popular media, particularly, *The Pirates of the Caribbean* film series. A positive consequence of naming was the added sense of ownership students felt toward their project and was an influencing factor in the design, particularly, the decoration of the land yachts.

### Team Details

Students also had the option of naming their team and these included Wild Wind, Super Sparkle, and Thingybob. Some took a nautical theme, for example, The Pasher Bulker, The Yellow Submarines, The Leaky Boats and The Flying Dutchmen. Others took the name of their yacht or used the initials of the team members. In five of the schools ( $N=16$ ), teams were numbered, for example, Team 1, Team 2 and Team 3.

Space had been provided to enter the names of team members to allow monitoring of students by teachers and inculcate students into the protocols of online authentication. This quickly became an issue as some schools, despite the password security access, were reluctant for students to be identified in this way. The oz-Teachernet group responded by adding a section on *Online Safety* to the project site and removed the mandate to enter real names from the guidelines recommending instead the use of nicknames. Teachers could then make their own judgements based on school or system privacy policies about posting names.

Details of gender, age were also requested which allowed simple demographic data collection and showed a rough gender balance (54% male, 46% female). The age range was from 9 to 13 years and students were enrolled in Years 4-7.

### Design notes

The first step of any problem-solving cycle involves planning. Land Yachts offered two different options for teams to share their plans. They could either scan and upload a labelled sketch or drawing (see Figure 1) or enter design notes to the site. Design notes were entered by 46 teams ( $N=143$ ) and these were categorised, using open coding, as either (a) descriptive ( $n=36$ ) or (b) detailed ( $n=10$ ).

- A *descriptive* design note was posted by The Donut Kings (3 males, 9-10 years) for *Sonic Lama*. They wrote:  
*We decided to make a yacht with white foam balls that were cut in half. We connected them through a museli [sic] bar box.*
- A *detailed* design note was posted by the Monkeys of the Caribbean (2 males, 1 female, 11-12 years) who, in describing the *Black Pearl*, articulated the following:  
*Materials: aluminium can, 3 skewers, 8 bottle tops, newspaper, paper, tape, cardboard*  
*Body: aluminium can*  
*Wheels: bottle tops*  
*Sail: cardboard*  
*Length: 11.5cm*  
*Width: 25.5*  
*Height: 26.5*  
  
*The black pearl is made of an aluminium can with both ends cut off as to make it aerodynamic. All the materials are light and that should make it go as fast as possible. The wheels are made of two bottletops stickytaped together. This is so that the sticky tape will flatten the sides. There are 3 sails, 1 large and 2 small, made of cardboard. They are strong*

and having 3 will increase speed and momentum. We may dip the wheels into water before testing for lubrication.

### Team results

The second step of problem-solving is to build and test the design. Students were able to record details of their trials which appeared on the site in a tabular form. The details to be recorded were date, type (weekly, race day), distance travelled (in metres) and time taken (seconds). A space was also provided for comments.

Displaying the team results as a table allowed a simple way of tracking the effect of design changes on performance. In most cases, details were added regularly through the project period (See Figures 3 and 4). Students generally achieved greater distances in less time with their final or “race day” result. The journeys to this outcome were interesting as there were frequent instances of changes which had a negative impact of performance, for example, adding extra sails causing the yacht to over-balance or move at an angle thus reducing distance travelled. Knowing that this was their development space, the students appeared to be quite candid and honest in the recording of their trials.

Date	Type	Distance Travelled (m)	Time Taken (s)	Comments
Sep 3, 2007	Weekly	3.45	60	We are happy with the distance it travelled but we might change the sail and we will see which sail will work better.
Sep 4, 2007	Weekly	3.1	6	Fan speed was high.
Sep 5, 2007	Weekly	6.95	8	We changed our sail. It's bigger and it works better.
Sep 6, 2007	Race Day	6.9	15	Race 1
Sep 6, 2007	Race Day	7.6	20	Finals

Figure 3: Test results (The Dragons, *The Dragon Racer*)

Date	Type	Distance Travelled (m)	Time Taken (s)	Comments
Aug 31, 2007	Weekly	0.15	20	We needed to make the wheels smaller and a sail on both sides.
Sep 1, 2007	Weekly	0.3	15	one of uor wheels were not touching the ground and our sail was not on the right way
Sep 5, 2007	Weekly	1.95	20	We think it will go further if we tilt it as it turns

Figure 4: Test results (The Quartet, *The Land Flyer*)

The comments posted to the Team Results table, although concise, provided a rich source of data. They were coded as (a) description ( $n=67$ , 40.36%), (b) explanation ( $n=91$ , 54.82%), or (c) prediction ( $n=8$ , 4.82%). The majority were descriptions or explanations ( $n=158$ , 95.18%) which is not unexpected given the purpose of these postings to “comment” on the numerical data presented.

The comments in Figure 2 and 3 provide examples of each category.

- *Description*
  - Fan speed was on high. (The Dragons, *The Dragon Racer*)
  - We needed to make the wheels smaller and a sail on both sides. (The Quartet, *The Land Flyer*)
- *Explanation*
  - We changed our sail. It’s bigger and it works better. (The Dragons, *The Dragon Racer*)
  - One of uor [sic] wheels were not touching the ground and our sail was not on the right way. (The Quartet, *The Land Flyer*)

- *Prediction*
  - We are happy with the distance it travelled but we might change the sail and we will see which sail works better. (The Dragons, *The Dragon Racer*)
  - We think it will go further if we tilt it as it turns. (The Quartet, *The Land Flyer*)

Together, these postings were demonstrations of student reflection and sense-making. The language was contextualised in the problem and the teams made idiosyncratic notes which made sense to them but whose meaning could only be inferred by others. Some recorded emotive reactions, for example, “it capsized and we were disappointed” (The Donut Kings, *Sonic Lama*). While it was suggested that teams conduct three trials before race day, some schools recorded their trials more frequently (as in Figure 3). It was clear that students were responsive to the testing and, through systematic problem-solving processes, were altering designs as they progressed.

## Blogs

Teams were asked to record their activities during the planning, constructing and trialing phases on the website. This was an opportunity for teams to record their progress and share their experiences with other land yacht racers. Research has shown that students who write about and monitor their learning have been shown to be more efficient learners (see Gourgey, 2001).

Each team had a blog as part of their team page (see Figure 2) and this was used by all participating teams ( $N=143$ ). Team postings and comments ( $N=1009$ ) were sorted into (a) postings made by teams to their own sites ( $n=593$ , 58.77%); and, (b) comments made by teachers or members of other teams ( $n=416$ , 41.23%). The text from the blogs was subjected to content analysis with postings treated as separate codable units (Henri, 1992) frequently evidencing multiple categories.

### a. *Postings made by teams to their own sites*

Team postings to their own sites ( $n=593$ ) were coded in four categories: (1) Description of activity; (2) Predicting results / future actions; (3) Evidence of trials / modifications; and (4) Evidence of teamwork / collaboration.

- The postings coded as *Description of activity* ( $n=121$ ,  $N=593$ , 20.40%) were literal descriptions of the process or stages that the teams were currently engaged in, for example:
 

*We used a 750ml Mt Franklin water bottle as our body, 2 milk cap lids on each front wheel (we will attach the caps with nails), 2 CD's with foam in between them for each back wheel (attached on with a chopstick going through the middle). We also used a chopstick to go through the bottle for the mast, and cut off material as the sail*

*(Scats, The Scat)*
- The postings coded as *Predicting results/future actions* ( $n=35$ ,  $N=593$ , 5.90%) were messages that focused on predicting possible results or what yet needed to be done. The messages in this category clearly demonstrated that the teams were engaged in an iterative or systematic design process.
 

*We have finished our land yacht diagram, listed our materials and connectives, written our individual statements and built our land yacht. We have predicted how far our land yacht will travel. Our predictions range from 1.2m - 1.5m. We all feel progress is going really well*

*(SDL, The Super Dooper Land Yacht)*
- The postings coded as *Evidence of trials / modifications* ( $n=149$ ,  $N=593$ , 25.13%) demonstrated that students were engaged in and working towards finalising their land yacht. These specifically mentioned trials and modifications, for example:
 

*We have change [sic] the wheels and instead of two wheels at the front we had one wheel at the front. We made the sail smaller and we used skewers to hold the sail together. 90% of our measurements have changed because we have made lots of mistakes. We have a new person in our group and he has done a load of work. Instead of using duck [sic] tape we used sticky tape.*

right side- 45cm left side- 30cm right back- 30cm left back- 30cm sail- 45cm across sail- 90cm front wheel- 10cm back wheels- 30cm for each across the top of body- 60cm across the bottom of body- 60cm We predict it will go about 4 or 5m.

(Wild Wind, Lightening Struck)

- The postings coded as *Evidence of teamwork/collaboration* ( $n=288$ ,  $N=593$ , 48.57%) were predominant. For example:

*We think our wheel was sabotaged by another team (but our teacher doesn't think so). We are having trouble putting it back on. In our first test we travelled 170cm in 10 seconds. We are having some trouble with our steering. Our land yacht has a lot of potential.*

(Team 1, West Coast Custom)

*b. Comments made by teachers or members of other teams*

A high proportion of comments were made in response to team blogs ( $n=416$ , 41.23%). These were made by teachers and students and were directed to teams in both their own and other schools. This is a clear indication of trust and a sense of community between the project participants. More critically, it demonstrates the principle of distributed constructionism (Resnick, 1996) stated as an aim of this project and provides clear evidence that the participants – both teachers and students - were co-collaborators in the construction of knowledge.

The comments made by others in response to the team postings were coded in three categories: (1) Comment on design / positive comment; (2) Asking a question; and, (3) Making a suggestion.

- The postings coded as *Comment on design / positive comment* ( $n=256$ ,  $N=416$ , 61.54%) were affirmative messages from other teams regarding the design of the land yacht or the team's progress.
  - A message from GGJ's (*Z-zoom*) to a team in their own school (Just Hangin', *The Flaming Dutchman*) offered that:

*I really like your name! THE FLAMING DUTCHMAN! I think maybe changing your wheels might help a bit more. Well done!*
  - A positive comment from a teacher (Mrs. A) to a team in her own school, which modelled online behaviour for students, offered:

*Congratulations on your first Windows Movie Maker presentations and uploads!*
  - Mrs A also made several positive comments on the progress of teams in other schools. For example, she posted the following for Team 2 (*The Wasp*):

*Congratulations on your great design. How far do you think your yacht will travel on race day? Looking forward to seeing your race & Good luck to you all!*
- The postings coded as *Asking a question* ( $n=105$ ,  $N=416$ , 25.24%) indicated that communication was occurring *between* teams and that participants felt a sense of trust in the community.
  - For example, a message from One Legged Liza (Deadly Fish, *The Scary Scarred Scurvy Sailing Ship*) to Team 3 (*The Flying Dutchman II*) in another school:

*Hi ya. What is the body made of? Can't really see it but it looks good. What will the body be made of? Tell me if it goes well.*

- The following interchange occurred over a period of four days between a team (Team 2, *The Wasp*) and a teacher (Mr B) in different schools. The numbers indicate the order in which the messages were posted.
  1. *We went really well when we tested our land yacht. We think it went 2 and a half metres. We are going to try and improve on that today by adding rubber bands on the wheels. [Team 3, initial blog]*
  2. *I love the look of your yacht. It looks really fast - nice light materials. I see you added rubber bands to the wheels for traction. How does this help the yacht? [Mr B, positive comment which poses a question]*
  3. *We have been trying to make it go further but it is very hard. We tried another flag but that made it go slower and we also tried rubber bands on each side of the weels [sic] and that also failed us so we are going to stick with the same yacht as before. [Team 3, response to Mr B's comment]*
- The postings coded as *Making a suggestion* ( $n=55$ ,  $N=416$ , 13.22%) offered advice to possible problems or issues raised by the teams.
  - For example, a message from the Deadly Fish (*The Scary Scarred Scurvy Sailing Ship*) to Team 4 (*Dusty*) in another school:

*It looks very good but maybe you should make the sail bigger and the wheels straighter. We think that maybe it might be a little to [sic] light.*

## Discussion

This project was purposefully built to facilitate active collaboration between students, teachers and the oz-Teachernet group within the context of Science, Mathematics and Technology. It has attempted, above all else, to offer a possible answer to Sendov's (1986) question about how we should build education in the presence of the computer. What it has done is replicate the priority of pedagogy over technology implied in the question and positioned it in the context of new technologies. In this, Land Yachts has offered a successful model of building active online interaction. The analysis presented in this paper has shown:

- Evidence, through the blogs and design notes, that the students had engaged in and were working towards achieving the aims of the project, that is, building a working land yacht within the given constraints ready to participate in the race.
- Demonstrations, through the comments in the Team Results, of reflection and sense-making.
- Evidence of knowledge building through team blogs, for example, the ability to iteratively apply experience and predict outcomes.
- Evidence through team blogs of teamwork and collaboration.
- Evidence, through responses by teachers and students to team blogs, of distributed constructionism.
- Collaboration through the negotiation of guidelines between teachers and the oz-Teachernet group.

The effectiveness of the Web 2.0 tools in the project was evident in the high level of participation in the blogs and the sharing of images. The spirit of Web 2.0 was captured in the nature of the interaction which was consistently affirmative and constructive. This was assisted by the robustness of the site which was iteratively improved and tested through the course of the project.

The project enacted distributed constructionist principles (after Resnick, 1996) and notions of "hard fun" (after Papert, n.d). The students shared their building of the land yacht and, in the process, learned a great

deal about the physical principles of momentum, traction, aerodynamics, and wind resistance. “Hard fun” was evidenced through the pervasive sense of students struggling and persevering with a task which challenged them to continuously improve their designs. The race day videos, accompanied by the sound of children cheering and calling encouragement, gave a glimpse of the fun students were having in racing their yachts.

The task given to students was intended to encourage scientific, mathematical and technological problem-solving through real-world design processes where collaborative teams use ICT to test and share ideas. Students in the Land Yachts project showed high levels of ICT Literacy (MCEETYA, 2005) through their easy and familiar use of online communication tools, and their creation and posting of digital still and video files. Students were working in both physical and virtual teams and, interestingly, seem to move between them in quite seamless ways.

Together these indicate that the aim to facilitate active collaboration between students, teachers and the oz-Teachernet group was realised. Students talked to known and unknown others and received feedback and support from them to complete a shared task. They were encouraged to invent, to be reflective and to re-invent. Through this project, ICT had been integrated into learning in quite seamless – but pervasive – ways. It just sat in the background and allowed it to happen. Sendov’s critical question about education in the face of technology, rather than being about technology being forced into education, had been answered – perhaps not definitively or comprehensively, but nonetheless answered convincingly at this time and in this instance. Rather than ever having a definitive answer, Sendov’s question should have multiple responses which meet the constraints of the available technology and the needs of students relevant to their times. Some questions don’t – and shouldn’t ever - have an answer.

In the *Land Yachts* project, we built a learning environment which actively encouraged and scaffolded online collaboration. This could be replicated through other projects with impact on other key learning areas. The teachers and students who took part entered this environment with the openness and trust needed to work in these spaces. The given task was fun but challenging. It had a relevance to the curriculum and provided real learning experiences in Science, Mathematics and Technology. It was the combination of these elements, and the dynamic between them, which has made this project an effective example of active online collaboration.

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