
Title	Makers on parade: The spontaneous emergence of a hackerspace within a school
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This is the published version of the following article:

Lim, K. Y. T. (2016, May). Makers on parade: The spontaneous emergence of a hackerspace within a school. *OER Knowledge Bites*, 1, 12-15.

<https://ebook.ntu.edu.sg/20190607-oer-knowledge-bites-volume1/full-view.html>

Makers on Parade: The Spontaneous Emergence of a Hackerspace Within a School

By *Kenneth Y. T. Lim*



MAKERSPACES HAVE BEEN hailed as exemplars of community-led grassroots constructs. Their rise in several countries in the West has led to a renewed interest in reframing learning in terms of models akin to post-industrial apprenticeship. Across the Pacific, makerspaces have also emerged and/or attempted to be nurtured in countries such as South Korea, Thailand and Singapore. These recent developments encourage the study of the extent to which emergent community-driven initiatives cohere with more traditional conceptualisations of ordered civil society which, characterise much of East Asia. This paper describes one such enactment in a state-funded school in Singapore, in which the local makerspace emerged without any formal structuring from those who might be seen as the brokers of power and authority.

With regard to the study being introduced in this paper, the makerspace and its supporting maker culture is situated within a secondary school in Singapore. It operates in a way which transcends the boundaries of both the formal and non-formal curricula.

The National Cadet Corps (NCC) (Air) is a popular Co-Curricular Activity (CCA) across schools in Singapore, regardless of gender orientation. Among the activities it organises are site visits to airbases operated by the Republic of Singapore Air Force, so as to give the student-cadets a taste of such a career option. As such, the NCC (Air) curriculum—which is overseen by an officer from the Ministry of Education (who is known as the Commander NCC [Air])—has two main components: foot drills and aeromodelling. The student-cadets are permitted to specialise in one or the other.

To build a healthy sense of competition and esprit de corps across the various NCC (Air) units emplaced within schools in Singapore, annual Aeromodelling competitions are organised on an inter-school basis. Teams from the schools compete to pilot remote-controlled scale-model aircraft around circuits, in much the same way that professional aerobatic stunt pilots would do.

A corollary of the training as student-cadets prepare for such tournaments is that aircraft will crash and will need to be repaired or replaced. Each school-based NCC (Air) unit is given autonomy to craft the curricular enactments in order to best prepare the cadets to fly the aircraft skillfully. The NCC (Air) student-cadets have designed a scaffolded curriculum spanning the four years of secondary school. The novice trainees (typically aged 12 to 13) are introduced to the principles and concepts of flight through flight simulation software. They then progress to practicing on remote-controlled powered-kites, and finally to the scale-model aircraft.

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What distinguishes the student–cadets at this particular school from their counterparts from other schools in Singapore is that they have developed a strong “can do”, or improvisational spirit within themselves, and this is primarily evident in how they approach the repair and tinkering of the design of the stock, off-the-shelf kites and model-aircraft which they fly.

Of equal interest is how some of the more senior student–members within the team have gone beyond just tinkering with the design of flying models, and have cannibalised parts to diversify into land-based, and even prototype water-based craft.

To elaborate, six of the senior student-members began to iterate designs and prototypes. A blueprint for an earlier design is shown on the following page.

In focus group discussions with the students, they described this initial design as follows:

“The RC Car V1’s body was to have been made of wood. The car would have been propelled forward by the two motors driving its back wheels. The rotation of the wheels would depend on the plastic servo located at the front of the car. However, the RC Car V1 was not built as there were various safety concerns and budget issues.”

The number of bespoke parts which would have been needed for their first iteration led them to look for possible sources to cannibalise. They described their thinking thus:

“The RC Car V2 was conceptualised and subsequently built but there is no image available

as it was dismantled on the same day that it was constructed. The car’s body was made of wood. The car was made with two sets of Cessna (aircraft) landing gears. It was intended to showcase how Cessna parts could be readapted to serve a different function as a demonstration of creativity.”

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– *Kenneth Lim,*
Office of Education Research

“One of the landing gear was glued at the back of the car while the other landing gear was attached to a servo, allowing the car to turn. A motor was attached to the back of the car in order to propel the car forward.”

The students also shared that during the course of their iterative attempts, they appropriated—with the permission and supervision of teachers—parts, materials, and machining tools from the school’s metalworking workshop managed by the Design

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and Technology Department, even though they were not necessarily taking Design and Technology as an academic subject.

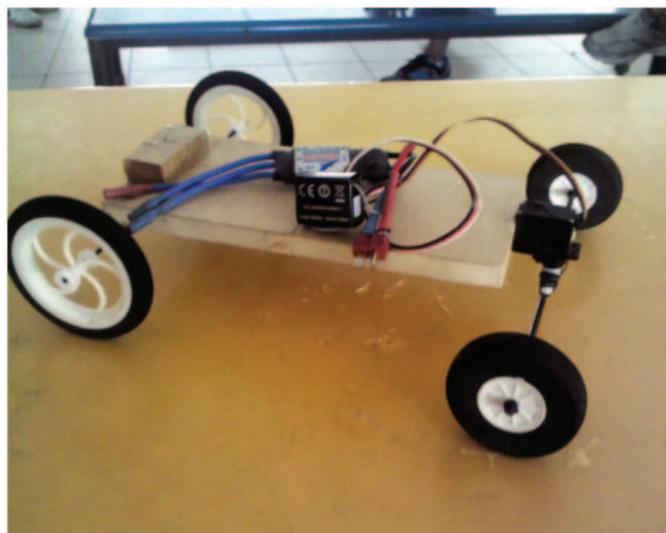
In fact, they went even further because in some cases, they found the soldering tools “not precise enough”. In these cases, they leveraged their social capital with the proprietor of the local kite-supplier, to gain access to the more well-maintained and up-to-date tools found in the proprietor’s personal workshop, even though the latter entailed a half-hour bus-journey beyond their local estate.

Of particular interest was that—as they continued iterating the design, and because they were personally invested in a task, which was both authentic and meaningful—the student-cadets gradually appropriated the epistemic frame of the designer and the engineer; thus, for example, they were able to describe a subsequent iteration of the go-kart:

They are able to operate fluently across what might initially come across as hard boundaries because they derive meaning and authenticity from their membership and participation in interest-driven communities

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“The RC Car V3 reuses the same wooden car body used by RC Car V2. However, a major design alteration involves wheels connected by carbon rods



are used instead of the Cessna landing gear. This alteration was made to lower the centre of gravity so that the car would be more stable. A Karbonite servo was used to turn the wheels instead of a plastic servo as the plastic servo will vibrate the moment the wheels are attached.”

In these and other ways, the maker culture that has spontaneously emerged within the NCC (Air) at this school finds enactions through seamlessly negotiating formal and non-formal structures of time and space within and without the schooling curriculum of an East Asian society more often associated with rules, laws, fines and regimented prescription. The study described in this paper suggests that the student-cadets are successfully able to negotiate both the formalised, regimental protocols of such settings as well as leverage—often informally through their own social networks—seemingly peripheral actors and structures such as kite-sellers, metal-working

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workshops and tools. They are able to operate fluently across what might initially come across as hard boundaries because they derive meaning and authenticity from their membership and participation in interest-driven communities—no one needs to tell

them to persevere and improve, instead they engage in a complex series of performances encompassing goal-setting, resource-evaluation and self- and peer-assessment according to both personal and socially moderated standards.

About the Speaker

Kenneth Y. T. Lim is a Research Scientist in the Office of Education Research at the National Institute of Education, Singapore. His doctoral research was on adolescent spatial cognition, and his present research interests lie in maker movements and the affordances for learning of fictive worlds and virtual environments. Most recently, Kenneth is editing a book entitled “Maker Culture and Makerspaces: Landscapes of participatory making, modding and hacking”.