

Privileged Maker Education in Underprivileged Community

Nalin Tutiyaphuengprasert
Darunsikkhalai School for
Innovative Learning
Bangkok, Thailand

<http://dsil.kmutt.ac.th/fablearnlab/en/home/>
Nalin@alumni.stanford.edu

Nusarin Nusen
Darunsikkhalai School for
Innovative Learning
Bangkok, Thailand

<http://dsil.kmutt.ac.th/fablearnlab/en/home/>
Nusarin.nus@kmutt.ac.th

Narongsak Yonprawes
Darunsikkhalai School for
Innovative Learning
Bangkok, Thailand

<http://dsil.kmutt.ac.th/fablearnlab/en/home/>
Narongsak.yon@kmutt.ac.th

ABSTRACT

As a learning consultant and trainer at Darunsikkhalai School for Innovative Learning (DSIL) in Bangkok, Thailand, our workshops typically take place in a well-resourced makerspace with access to tools like laser cutters. This paper describes how we modified our workshop for a remote Thai village with few high-tech resources. By combining student and teacher workshops, participant teachers were fully immersed as both learners in an authentic design task, and as facilitators for the student workshops. Teachers noted that even students considered to be less academically capable were able to gain expertise and articulate their own learning when challenged to create real products that solve local problems. We learned how to make do with local resources and still provide a high quality professional development experience for teachers, plus a unique learning experience for students.

Keywords

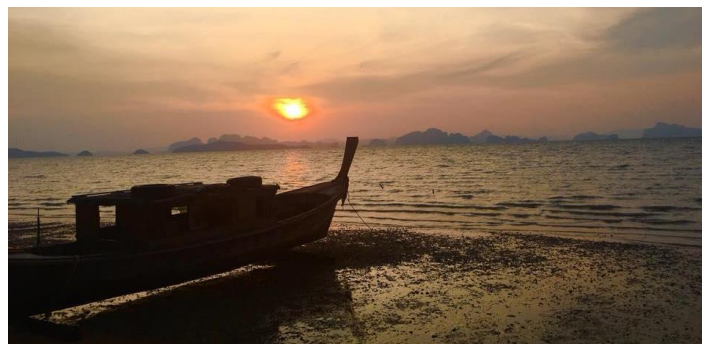
Professional development; maker education for underprivileged; low-cost; design process; immersive local maker experience

2. DESCRIPTION

2.1 Description of your setting

My team and I were invited to provide a week-long workshop during the school break for a small public school on an island in the southern part of Thailand. This is an hour long flight from Bangkok to Phuket, a car trip to the port and then a 45 minute ferry trip to Koh Yao Noi island. This project was sponsored by the Chaokoh Foundation and our school in Bangkok, DSIL. The plan was to lead a week of training for 6 teachers and 24 students. The community is 98% muslim and 2% buddhist. Students were from two different grade levels, 12 students from 5th grade and another 12 students in grade 11. They were equally split by gender, half boys and girls in this group. At the beginning, the younger group looked frightened to be in the same class with the older students, but they became more comfortable as time went on. It was the first time for these teachers and students to experience project based and experiential learning. My team and I lead the teacher workshop, and also had the teachers work as our assistants during the student camp.

The workshop took place in a big classroom in the school. This school is a five minute drive from the main pier and a five minute drive from the community and local market. All the students and teachers drove mopeds to the school. We were lucky that the weather was nice and was very helpful for us to conduct activities outside and inside classroom. We planned to use the local community as a part of the projects. We spent six days together from 8:30 AM to 4:00 PM. I worked with the teachers for a full day before the student workshop started to prepare for the camp together. Then every day after the four day student camp, I discussed the day with all the teachers. On the last day after students finished their expo and camp, teachers stayed in a training with me to recap their experiences together.



Picture 1. Koh Yao Noi Island, Thailand, 45 minutes from Phuket.

2.2 Description of the educational experience

We designed two workshops that would happen simultaneously. One workshop was for teachers, the other for students. We introduced an ethnography research experience to the teachers to practice how to observe informal learning environments and to learn from what they were observing. The teachers practiced how to make observations, learned to take fieldnotes, and discussed how observing is important in project based learning and maker education. Then I assigned teachers to collect data from the 4 day student camp and put them in the role of TA, helping me support the students in all the activities. They managed their time during the day between taking notes and working as a TA. Everyday after camp, we had a reflection among the teaching team. After we finished the 4-day camp for students, all teachers wrote a short report about what they learned in the past week and designed a lesson plan using the new techniques they had learned.

The second workshop we designed was a 4 day camp for students. We planned to bring students through a design thinking process, to facilitate how to make a project from scratch. We hope that the kids will pick up the design steps and use them later for future projects in other classes. Over the four days, the students built several prototypes, learning how to find local materials for their project designs instead of using other materials brought from outside. The school had microcontrollers called Gogo boards which were rarely used. We retrained them how to use those boards in one hour and let the students appropriate different materials into their projects. We asked students to think about local problems. To find authentic problems, they went out to interview people in the market, food stalls, their home businesses and bring back information to class. Students made projects for some teachers, their own family businesses, and other people in community.

In our DSIL makerspace, we have access to many high tech tools like laser cutters which provide quick digital design experiences and fast prototyping. So the first question that came to our minds when we tried to design a maker's experience workshop without these resources was "How can we make it fast and possible when we have limited time to make prototypes?" In a big city like Bangkok, the laser cutter plays a main role in makerspace. For many people, mastering such a futuristic, high-tech tool starts off a 'can do' attitude that carries forward into further success. How would we create this same sense of accomplishment in this small community, far away from the city where blackouts are common. (We actually had dinner in a small local restaurant under the candle light!) We were thinking of local resources and trying to find the local stores and learned about the available materials quickly. Our best discoveries were a dollar store and a construction material store on the island. We sourced all our resources from those stores and we requested the students to bring cardboard boxes from home to be a part of their project.



Picture 2. Workshop in teacher's meeting room.



Picture 3. Students are making their 2nd prototype by applying materials from a local dollar store

There were many interesting projects such as an automatic fish scale remover, made for one of the student's parent. Another project was an automatic cooking and stirring device for an elder in the community who made Thai desserts to sell in the market. A student made an automatic toilet cleaning machine for a teacher who mentioned that cleaning the toilet is something difficult for her. Students made two prototypes in three days for their users, first a paper prototype and then they developed the second prototype after taking them to users for usability tests.



Picture 4. Testing a prototype of an automatic scale remover machine.



Picture 5. Everyone used mopeds to commute on this island. Students are bringing their prototypes out for testing with users.

Students were really happy and understood the design thinking process very quickly. Students and teachers enjoyed coming to class everyday. Sometimes the students enjoyed the work so much that they struggled because they wanted to continue working with classmates but they had to go home to help their parents with house work. Some students lived far away, and they had to reluctantly leave to get to the boat on time to be able to get home. The students were engaged in every aspect of these projects.

3. CONCLUSION

3.1 Results

As outsiders, we observed that both students and teachers seemed happy and satisfied with the workshops. We gained additional insight by talking to the local teachers. They reported that some students changed their behaviors. Some top scoring students struggled with problem solving. They became slower problem solvers comparing to other “back row” students. Some low performing students paid full attention to class became very active. Some students who were normally quiet, practiced very hard and presented their projects in front of the class. Teachers started to see that students have different ways to express themselves and everyone can be good at something.

For local teachers, getting them to see things in different perspectives may give them some new ideas about different ways to interact with students. However, teachers in this group were in different school contexts and the school was in the transitional time. I do not have evidence of long term results yet. Our discussions with the teachers after the workshop were promising. Some teachers are interested to use design thinking as a model in their classroom. We are connected with some students in this workshop and they fondly recall the projects they did and have requested us to visit them again.

For myself, as a team leader, I learned a lot from this experience. It was my first time leading a workshop that was 100% reliant on local resources. I learned more about local materials and the impact on our workshop because they were in different places on the island. The construction material store was quite far from the school. We needed to make a good shopping list because we couldn't go there very often during the day. Some students and teachers brought materials from home to be a part of their project. Students rode their mopeds to get some materials for class and to test prototypes with their users. This was new learning dynamic for me as a maker facilitator used to a well equipped digital fabrication lab in a big city where it would be impossible for students to simply get up and leave the school.

The dollar store was a very interesting learning resource for me. It took a little more time to think about projects with the limited resources found there. It's also an opportunity to apply existing materials to the problems we are trying to solve. A trash bin became the container for a fish scale remover machine. Two different sizes of mixing bowls were used as double boiler for the automatic stirring machine. Dish scrubbers, reused glass bottles, rubber bands, and other household objects can be repurposed to represent students ideas really well. It is hard to say if having laser cutter or 3D printer would have resulted in better projects. However, I am quite sure that the idea of using existing resources as a part of their innovations will be practical for them for long term.

I get to learned an important lesson for myself as a trainer that in real life, it doesn't matter if people use the right vocabulary words, or find the perfect materials. What matters is the ability for them to internalize the design process and make their own version of maker education. The result, situated in the needs and resources of this community may even be richer than the more isolated environment of kids in the big city. They may not have a laser cutter but they have more immediate access to people who have real problems that need solving and the natural resources around them. Instead of thinking of this as a poor setting, I now consider this a very rich learning environment since the school and community are tightly connected, without the usual walls that insulate students from the real world. Now I have returned to the big city and have full access to fancy digital fabrication tools. But the beautiful walls that surround my school make it harder for us to connect to the community outside. In any setting, there are always things to balance and ways to make it work. It's important to learn to understand your own resources and start from there. What matters is starting now, we don't have to wait until we are fully equipped to do something interesting.

We can do things that matter with the resources in our hands by localizing ourselves as fast as we can and getting started! I'm coming back to my school with new ideas of how to provide low-cost but rich learning makerspaces and low cost tools for children in rural areas of Thailand. I will continue to think of how to pack simple but powerful pedagogical strategies into workshops so that teachers will be able to work on their own and build ownership in their own version of maker education. This is still work in progress for me and my team in Thailand.

3.2 Broader Value

I think there are many labs around the world with different resources serving different communities. We don't need the same equipment to do something interesting. We can adjust to locally available materials which makes it easier to start and sustain. I'm interested in studying more about low cost makerspaces and what do we need to get it started while making it more sustainable in long term. I think if we can find ways to make it low-cost, affordable but equipped with a strong learning structure, this would help students and teachers who need help the most.

3.3 Relevance to Theme

The topic of sustainability in the long term is especially relevant in providing opportunity for underprivileged areas. Sustainability is not just saving money on tools, but in providing pedagogical strategies to teachers that they can make their own.

4. BIOS

Nalin Tutiya-phuengprasert (Tukta), co-founder and senior vice provost of Darunsikkhalai School for Innovative Learning in Bangkok, Thailand. She has her background in cinematography (BA) and master degree in Business Administration(EMBA). She also got a master degree from Stanford Graduate School of Education in Learning, Design and Technology class 2015. She involved in Constructionism application in Thailand both in formal and informal education since 2001 as teacher in project based learning, school administrator responsible for academic and international affairs. She was a co-founder of the first FabLab called DSIL FabLearn Lab in Thailand in collaboration with Stanford's FabLearn program since 2013. She is currently working as interaction designer, trainer for teachers and director of the upcoming social enterprise project to scale up Constructionism and Digital Fabrication for Learning in Thailand.

Nusarin Nusen (Nu), FabLearn Lab facilitator and trainer assistance of Darunsikkhalai School for Innovative Learning in Bangkok. She worked as science and project facilitator at DSIL for 5 years in primary education. She has her background in computer engineering from Chiangmai University and involved with project that developed programming tools for kindergarten students. She became instructor assistant since 2016 and collaborated with Nalin to design and teach workshops for young students and adults.

Narongsak Yonprawes (Nok), FabLearn Lab facilitator and trainer assistance of Darunsikkhalai School for Innovative Learning in Bangkok. He has his BS in computer and electrical education from KMUTT. He taught 3rd grader science and robotic class for one year and became a part of DSIL FabLearn Lab team since 2015. He has now designing workshops for young students and consulting students' projects in high school level. He is highly interested in projects that involved programming, robotics for young students and adults.

5. REFERENCES

Link to prototyping process : <https://www.youtube.com/watch?v=ekE1bEvZN3Q&feature=youtu.be>

Link to product testing process : <https://drive.google.com/file/d/1P3FWdUCTr3ukwWIIX-X4EN7GhiAVoIjk/view?usp=sharing>