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Electronics and Programming Education for Grade-School Children in Kathmandu

Objective

My goal is to inspire young peoples' interest in programming and electronics through hands-on activities. These two complementary topics form a creative foundation from which we can affect the world around us, from communication and self-expression to the delivery of basic healthcare. Digital literacy is an essential skill for children today, and the potential impact is greatest within low-income communities where it can enable ongoing education and empowerment. There is a world of opportunity open to young people with a passion for coding, tinkering, and creating.

Background

In 2010, I visited Shree Mangal Dvip (SMD) boarding school in Kathmandu Nepal. The vivacity and motivation of the nearly 600 students left a lasting impression. The students had come from dire circumstances in Himalayan communities to make the most of an opportunity for education, made possible by the support of a dedicated and passionate group of teachers and caregivers. Now, graduating as an Electrical Engineering undergraduate student from the University of British Columbia, I would like to share my excitement about programming and electronics with the students of SMD in the hopes of establishing a lasting initiative to promote digital literacy in children.

Plan

I will arrive at SMD in August 2017 and work with them for a period of 10 months. Lessons and workshops will be developed using the resources made available through initiatives like the Rasberry Pi Foundation, Activa, Arduino, and UBC Geering Up. In addition to these activities, I would like to strengthen connections between SMD and the existing Maker community in Kathmandu by arranging field trips to makerspaces such as Nepal Communitere, and arranging guest speakers and activities from organizations such as the Robotics Association of Nepal.

The activities will be designed for sustainability in a resource-limited environment, and focus on engagement with the broader community, both in Kathmandu and online through open-source initiatives. The students will also explore the safe and effective use of the internet for discovery and sharing. Workshops will be conducted in groups of 5-10 students. Separate activities will be developed for different age-groups, starting with the senior students then adjusting accordingly. I hope to reach the broadest range of age-groups possible given the language barrier. The direct impact of the initiative will be approximately 100 students. The broader SMD community will also benefit through the establishment of connections with the maker/STEM education community in Kathmandu.

Long Term Goals

After leaving Nepal in the summer of 2018, I hope to have empowered the students and staff at SMD to continue with programming and electronics activities at the school. Senior students and school staff interested in championing the initiative will be identified and trained accordingly. Another goal is to forge lasting connections between SMD students and the local maker community to encourage continued hands-on learning. Through relaying the experience I have at SMD, I hope to motivate other new graduates to start or participate in similar initiatives.

Resources and Timeline

- April – July 2017: gather teaching resources and materials.
- August 2nd 2017: arrive in Kathmandu, Nepal.
- August – October 2017: Setup teaching environment at the school, recruit initial participants, and arrange the first workshop.
- October 2017 – May 2018: expand lessons/workshops to different groups of students at the school, connect the school with local initiatives through visits both to and from makerspaces and programming/electronics/robotics clubs.
- May 2018: Finalize handoff procedure with students and staff who will continue with the initiative.

The following resources are intended for working with groups of approximately 5-10 students, with some extra margin for replacement parts.

Description	**Quantity**	**Total Cost (CAD$)**
Arduino Uno Starter Kit	10	2600
Raspberry Pi Zero	10	140
Raspberry Pi Accessories (connectors, memory cards)	10	250
Crafting supplies (cardboard, paper, scissors, glue…)	1	10
USB computer mice and keyboards (available at SMD)	10	
Desktop computers (available at SMD)	10	
Tools		
Hand tools: wire strippers, wire cutters, plyers, solder sucker	1 set	20
Soldering iron	1	50
Digilent Analog Discovery 2 – power supply, waveform generator, scope	1	382
Multimeter	2	40
Logistics		
Extra checked luggage	2	200
	TOTAL	3692

Materials that cannot be bought in Nepal will be brought in checked luggage.

Partners

Shree Mangal Dvip (SMD) Boarding School – https://www.himalayanchildren.org/
Located in Kathmandu, SMD educates, houses, and cares for more than 500 vulnerable children from the culturally Tibetan northern villages of the Nepalese Himalayas. "My aim is to preserve the culture, language and Buddhist way of life of the Himalayas, and to give Himalayan children the tools to build a better future so they can help their own people when they grow up" – founder Thrangu Rinpoche. SMD school children will be the first participants of this initiative, and SMD will host the activities.

UBC Faculty of Applied Science – https://apsc.ubc.ca/
The faculty has generously provided sponsorship for the initiative to help cover the cost of materials, tools, and other resources.

UBC Geering Up – http://www.geeringup.apsc.ubc.ca
Geering Up has agreed to share their teaching resources and act as mentors for the initiative. They have 20 years of experience running engineering and science camps for kids, to encourage youth in British Columbia to pursue careers in science, engineering, and technology.

UBC eng•cite – http://engcite.engineering.ubc.ca/
An initiative to increase female enrollment in engineering programs in Canada to 50% by the year 2020. Eng•cite has agreed to share their lesson plans and teaching material for use in this initiative.

Potential Partners

Nepal Communitere – https://www.facebook.com/NepalCommunitere/
In the news: https://www.devex.com/news/inside-nepal-s-post-quake-maker-space-89143
A makerspace located in southern Kathmandu

Innovation Hub Kathmandu – http://fncci.org/innovation-hub-159.html
A makerspace and library at the Federation of Nepalese Chambers of Commerce

Robotics Association of Nepal – https://www.facebook.com/nepal.ran
Organizes workshops and events focused on robotics education

The Raspberry Pi Foundation – https://www.raspberrypi.org/
Maker of low cost computers and teaching resources to expand digital literacy and encourage people to learn about computers

Arduino – https://www.arduino.cc/
An open-source microcontroller development platform

Processing – https://processing.org/
A tool for learning programming through visual tools

Scratch – https://scratch.mit.edu/
A visual programming education platform to create games, stories, and animations

Element14/Newark – http://www.newark.com/
Supplier of electronics and equipment