

A Self-Sustaining Model for Peer-to-Peer Engineering Education Among Children in Low Resource Environments

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Objective



- ▶ Teach hands-on programming and electronics; spark interest; boost confidence
- ▶ Make a self-sustaining student-led club

Boudha, Kathmandu



Powerlines in Nepal





Overview

- ▶ Input:
 - ▶ 11 months in Nepal
 - ▶ \$2300 USD (20K SEK) in funding (plus \$800 in private support)
 - ▶ \$7600 USD (70K SEK) in personal living expenses
- ▶ Outcome:
 - ▶ 300h of activities completed
 - ▶ currently 11h/wk of activities with 70 students
 - ▶ published curriculum of 12 activities and two projects (36h of material)
 - ▶ 2 years funding for validation of the peer-to-peer education model (\$1800 USD, 16.5K SEK), and \$260 remaining cash budget.

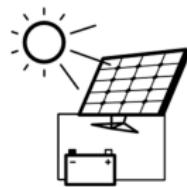
Part 1: Programming



▶ Code Club:

- ▶ Lessons from the Raspberry Pi Foundation
- ▶ Student leaders meet 1x per week to do activity together, then they lead a group of 10
- ▶ scaled from 10 students to 50 in just two weeks. Now 70.
- ▶ Parts: \$1300 USD

Part 2: Electronics



FOUNDATION
GROUP

CAR PROJECT
GROUP

SOLAR PROJECT
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► Electronics Activities:

- ▶ Developed a basic curriculum of 12 activities, followed by 2 projects
- ▶ Fundamentals of electricity, building simple circuits, soldering, programming Arduinos
- ▶ 50 students split into 3 groups
- ▶ Parts: \$1000 USD (possible with \$350)

Makerspace In a Box



Tashi



Getting Started



- ▶ priority: get things started. Tashi and I did activity 1 the Saturday after I arrived.
 - ▶ This initial approach involved 4 sessions to meet the demand (up to 100, anyone welcome age 10 and above)
 - ▶ New activities each week

Forming the Club



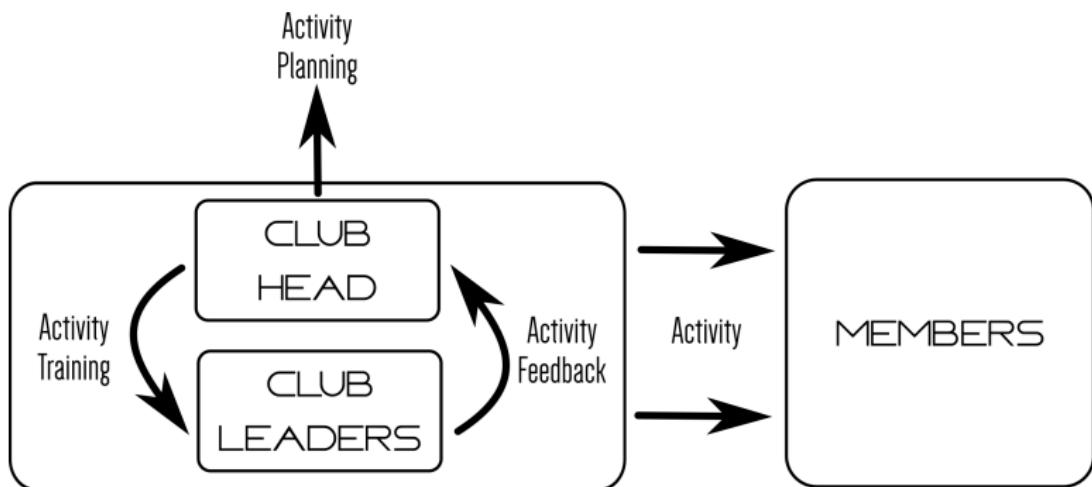
- ▶ Built a sense of ownership/pride
- ▶ Easier to plan activities
- ▶ Progress to more complex topics with dedicated students

Initial Club Model

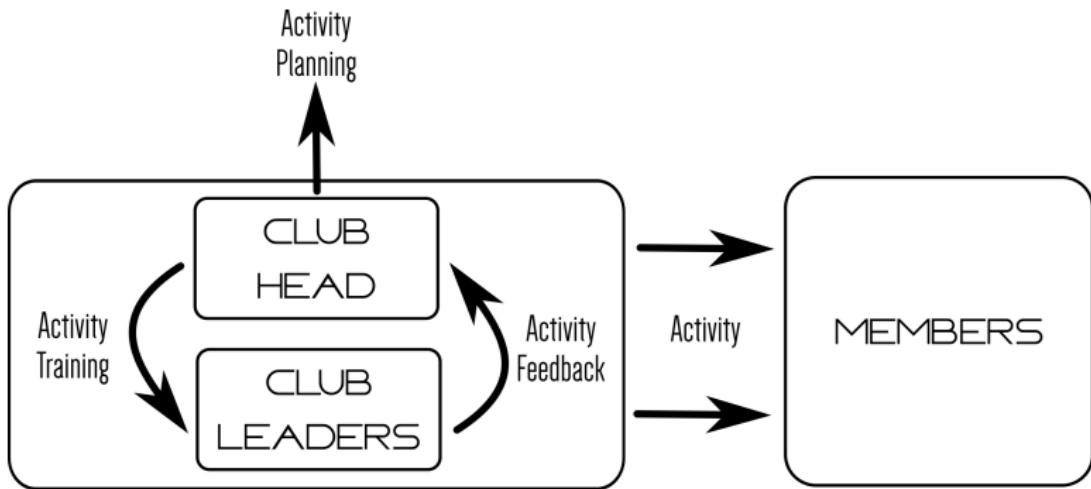


- ▶ Planned and taught by Tashi and I
- ▶ Student leaders: helped, answered questions

Initial Club Model

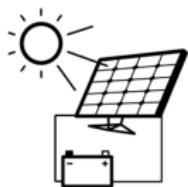


Initial Club Model - Weaknesses



- ▶ Top-heavy, not practical for student leadership
- ▶ No recruitment structure
- ▶ Little continuity between activities

Updated Club Model



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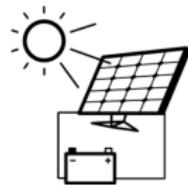
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- ▶ Year-to-year schedule
- ▶ Clearly documented curriculum
- ▶ Entirely student-taught
- ▶ Built-in strategy for growth

Groups



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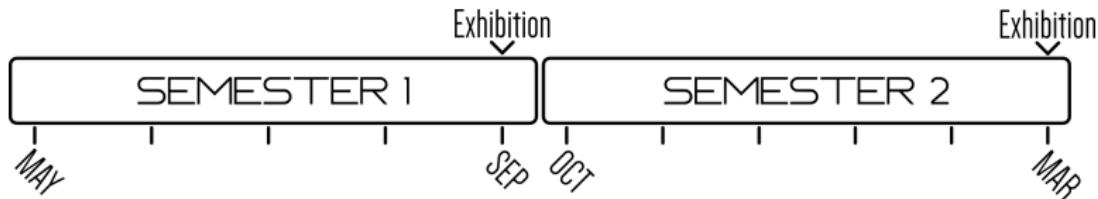
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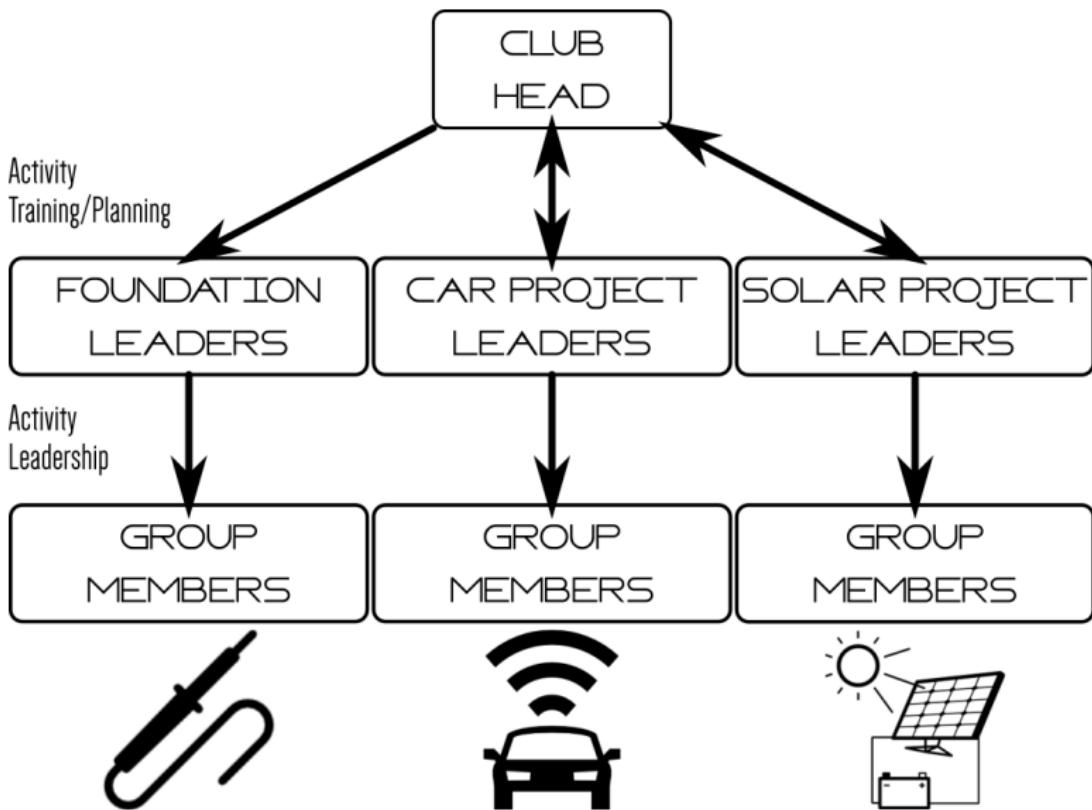
- ▶ Foundation: new club members learn fundamental concepts
- ▶ Projects: students to apply their knowledge, build something unique, and learn about the engineering design cycle

Semesters

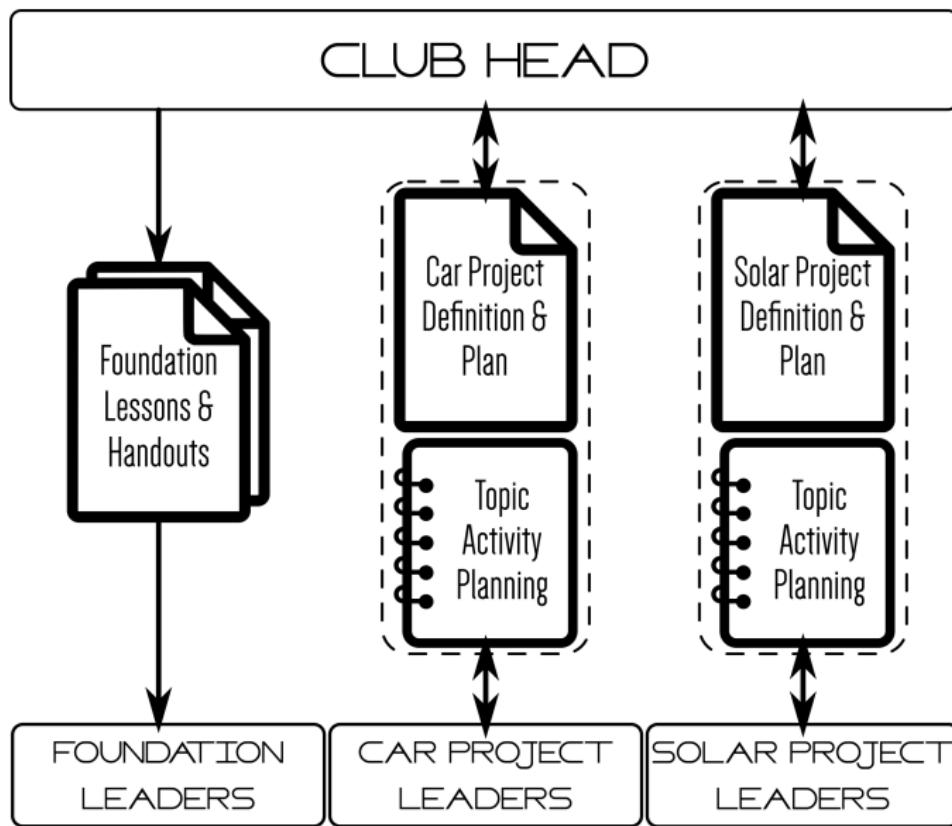


- ▶ Scheduled activities into 6 months semesters
- ▶ Exhibitions
- ▶ Allows for regular group and leadership transitions

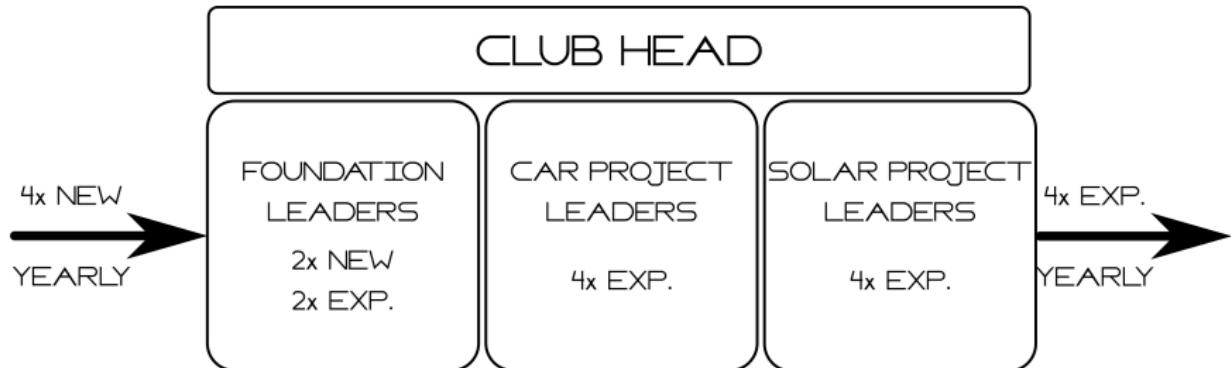
Transferred Teaching Responsibility to Students



Teaching Materials

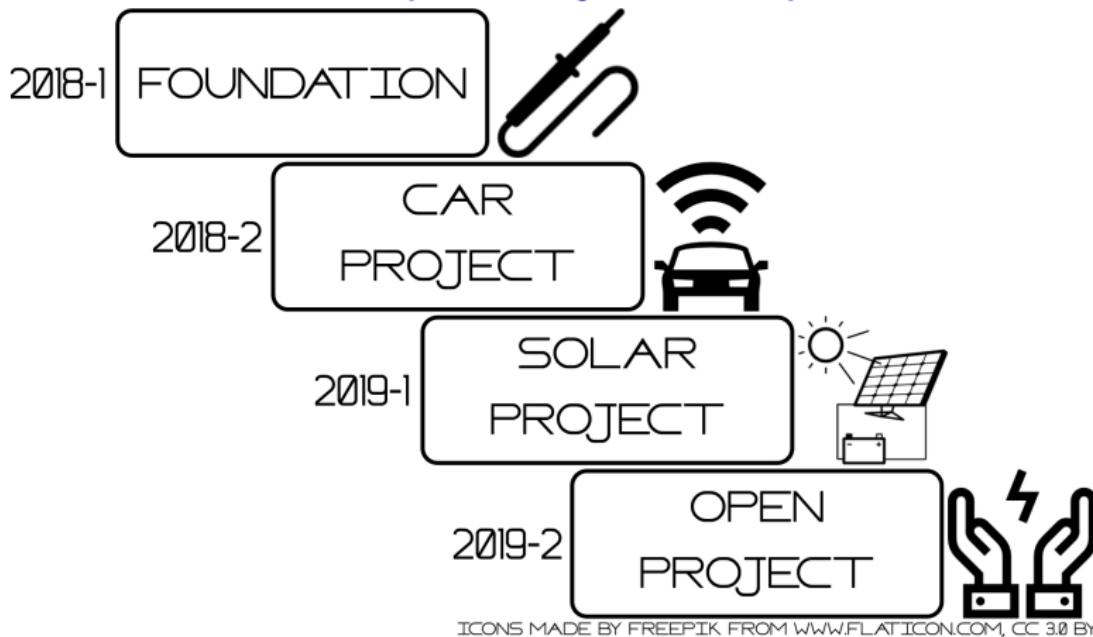


Leadership Transition



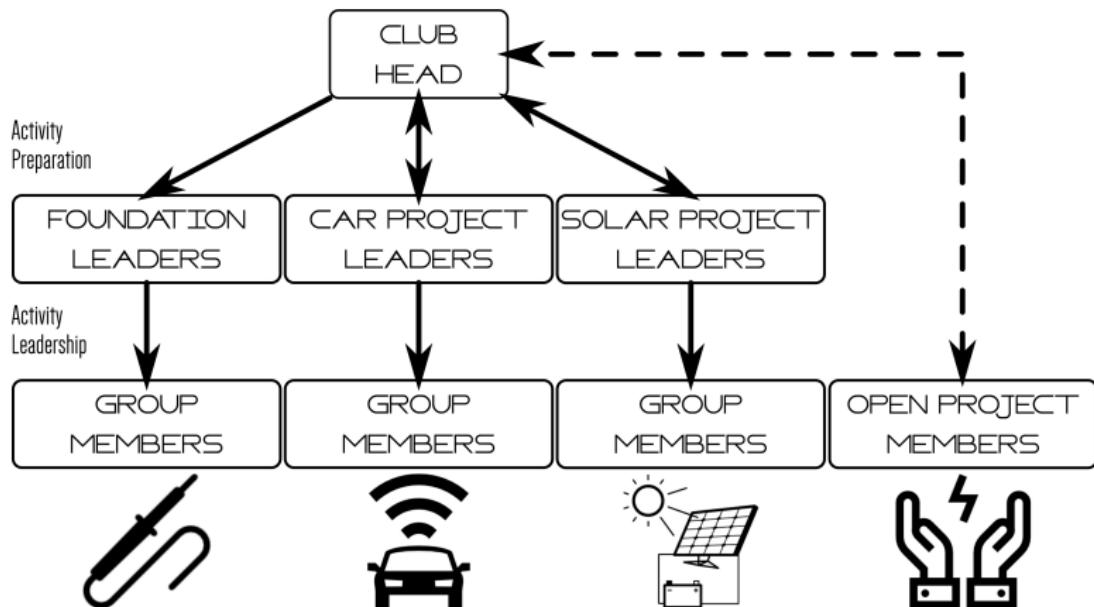
- ▶ New and experienced leaders work together
- ▶ Leaders in = leaders out
- ▶ Graduated leaders can become the next Club Head

Future Growth: The Open Project Group



- ▶ Advanced students work together in groups of 3-4
- ▶ Select project and work on it
- ▶ Could be used as a future repeating project for all club members

Future Growth: The Open Project Group



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What's Next?

- ▶ Is it really sustainable? Testing for 2 more years.
- ▶ Share and improve
 - ▶ Publish documentation and share
 - ▶ Iterate based on feedback, updates from Nepal
- ▶ Visit to observe/adjust
- ▶ Apply in other contexts (with partners at UBC)
- ▶ Spread and support the wider use of the

How Can You Get Involved?

- ▶ Contribute a new activity or project
- ▶ Visit HMG and teach an activity or project
- ▶ Implement a similar club locally
- ▶ Adapt the model for use among LTH students
- ▶ Review documents and provide feedback
- ▶ Share with others who might be interested