Leapfrogging our teens

A proposal for feedback from the team

Founded on discussions with Vocational Training Committee, tribal leaders and support team

Text in grey/blue and most pictures in this slide deck are copied from internet. Due credits are given in the notes section

What can our teenagers do?

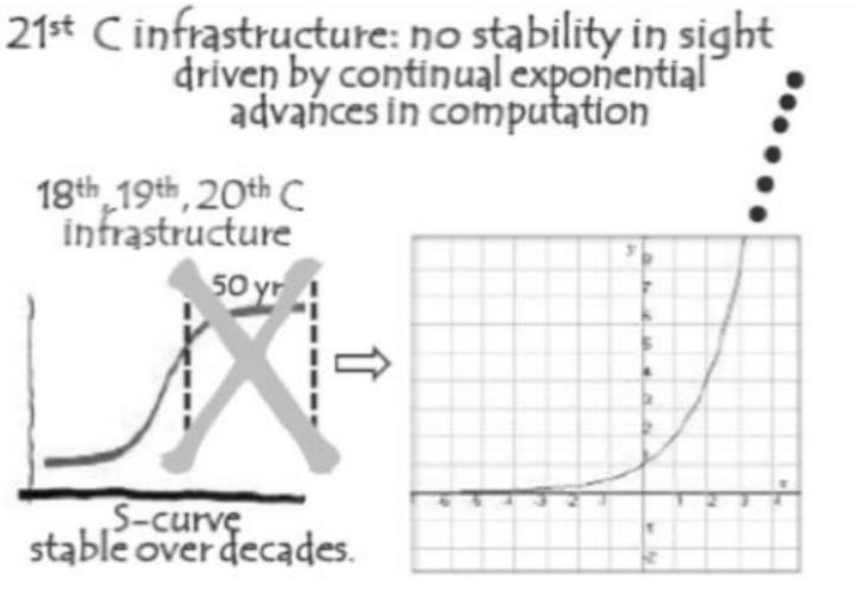
School going	Class 8	Class 9	Class 10	Class 11	Class 12	Total
14 years	285					
15 years		203				
16 years			159			
17 years				75		
18 years					60	
Yearly school going teens						**782**

Drop out (after)	Class 8	Class 9	Class 10	Class 11	Class 12	Total
14 years	61					
15 years	48	33				
16 years	25	40	46			
17 years	27	45	45	9		
18 years	45	54	66		11	
Total	206	172	157	9	11	
Teen drop out per year						**160**
Current dropped out teens						**555**

(14 to 19 year olds as of 2016)

Estimates based on data from Gangatharan

.. to face an uncertain tomorrow (while they still catchup with today)?



Tata Robots for MSME from 4L

? Drug and Alcohol Abuse

? Love affair and ..

? Lack of basic education despite schooling

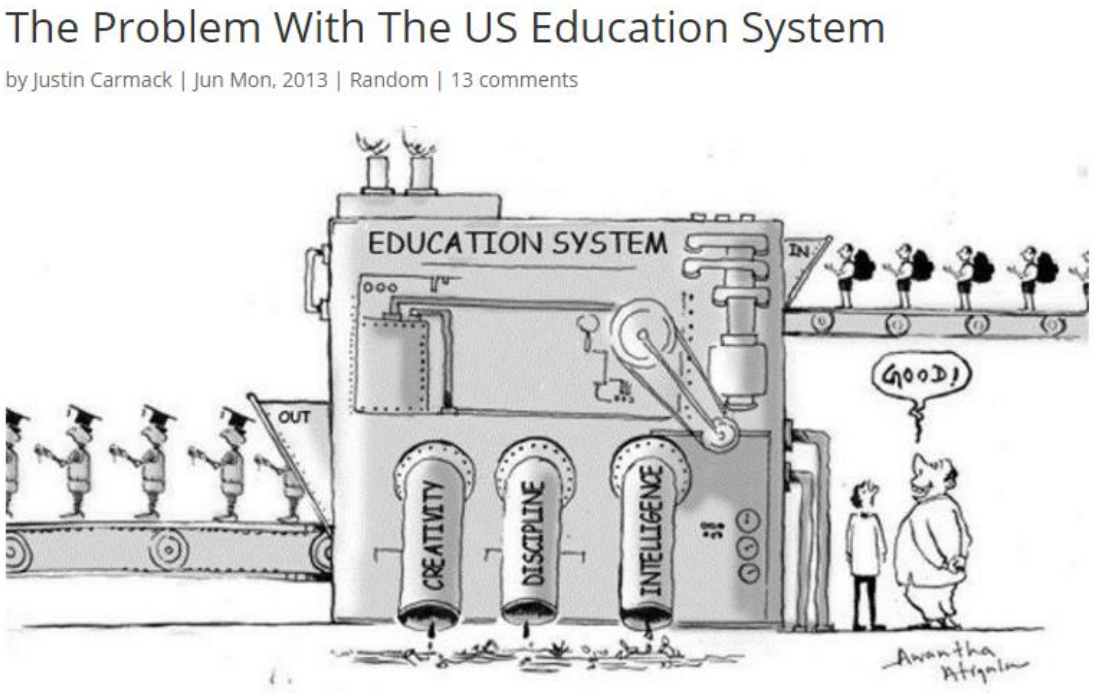
? Poor nutrition and physical/mental health

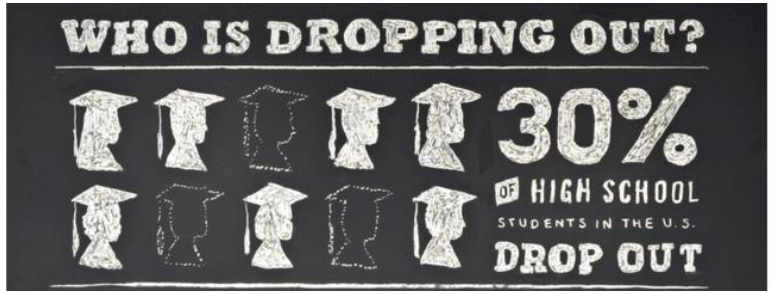
"In the Robotic Near-Future, Most Will Live Off Government-Provided Income?!"
How does one live a full and active life without an occupation?

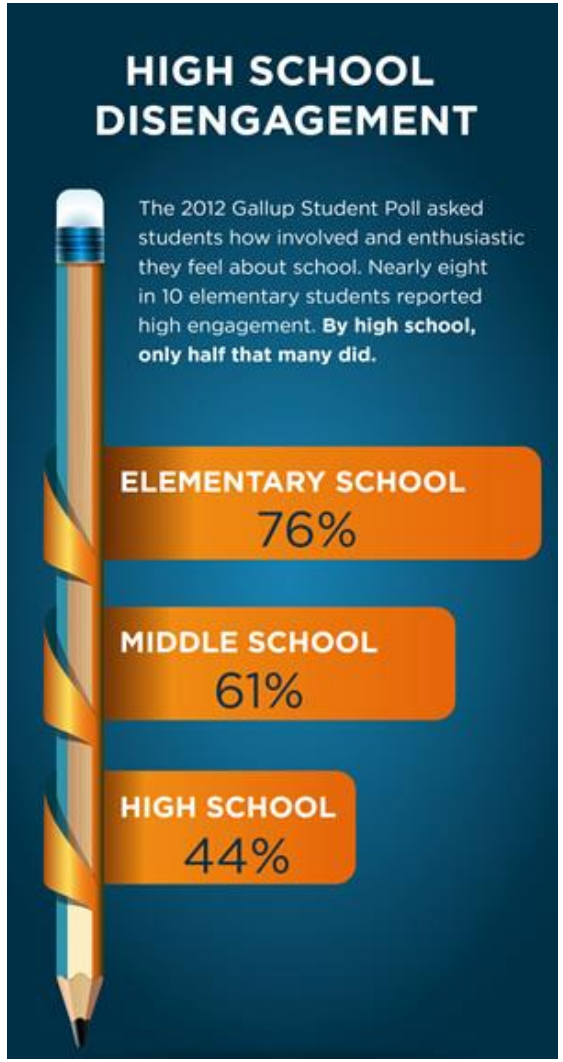
- "To survive, to avert what we have termed future shock, the individual must become infinitely more adaptable and capable than ever before. We must search out totally new ways to anchor ourselves, for all the old roots - religion, nation, community, family, or profession - are now shaking under the hurricane impact of the accelerative thrust."
- "The world moves very quickly; 65 percent of jobs that people will occupy in the course of their lives, if they're graduating now, don't yet exist. It's important to give people the tools for lifelong learning and to remake educational institutions so they can provide lifelong learning."
- "To thrive, (one) must learn to imagine creatively, reason systematically, work collaboratively and learn continuously."

We are not far off..

- Majority of the teens across the world don't get real education to face the future
- Developed countries have just started to revolutionize (?) some of their schools
- Our kids have a natural flair to excel in the education paradigms of tomorrow





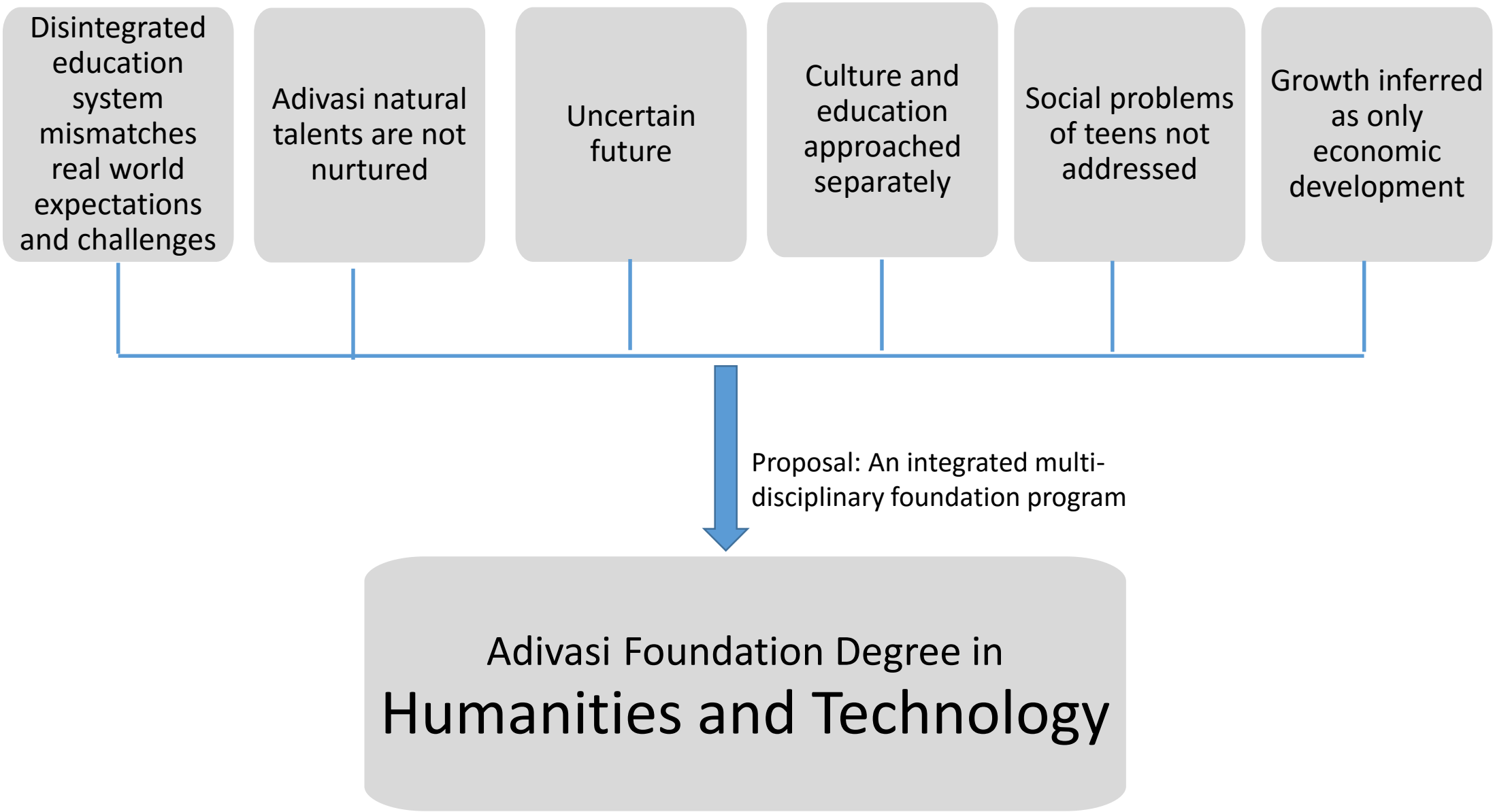


"...I'm announcing a new challenge to redesign America's high schools so they better equip graduates for the demands of a high-tech economy... "

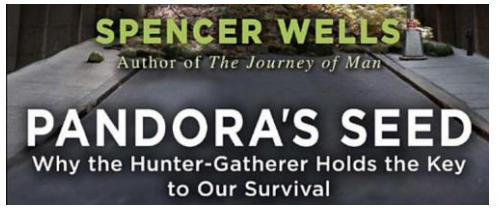
.. we can rely on our strengths to..

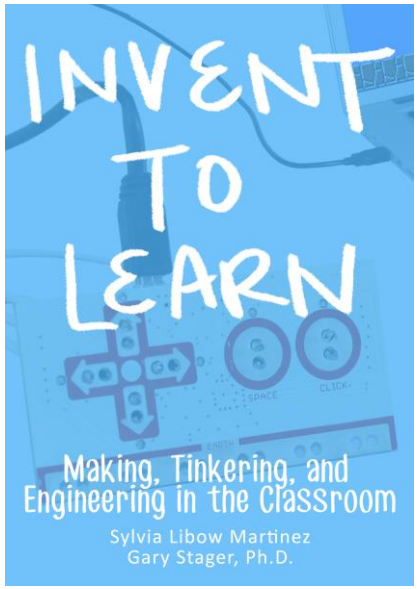
- Establish a multi-disciplinary teen education program that enables them
  - to learn to imagine creatively, reason systematically, work collaboratively and learn continuously
  - by exposing them to various activities and projects with tools of yesterday, today and tomorrow, rooted in the adivasi values
- Take small steps..
  - Construct one such program as a small-scale experiment with students finishing 8th and 10th standard from Vidyodaya SSA in 2016
  - After the initial ramp, attempt short-term outreach programs with more teens
  - Once stable, institutionalize ..
- After they finish the program.. they'll have options to
  - Continue academic education with a renewed interest
  - Specialized training programs that can lead to an occupation
  - Apprentice opportunities
  - Become anchors or leaders in the community
  - Work with us
  - Go about their lives better
  - Pursue further opportunities based on their passion/talent they discovered

Challenges of today's adivasi teens



The dream.. **Adivasi** Foundation Degree in **Humanities & Technology**





Mission

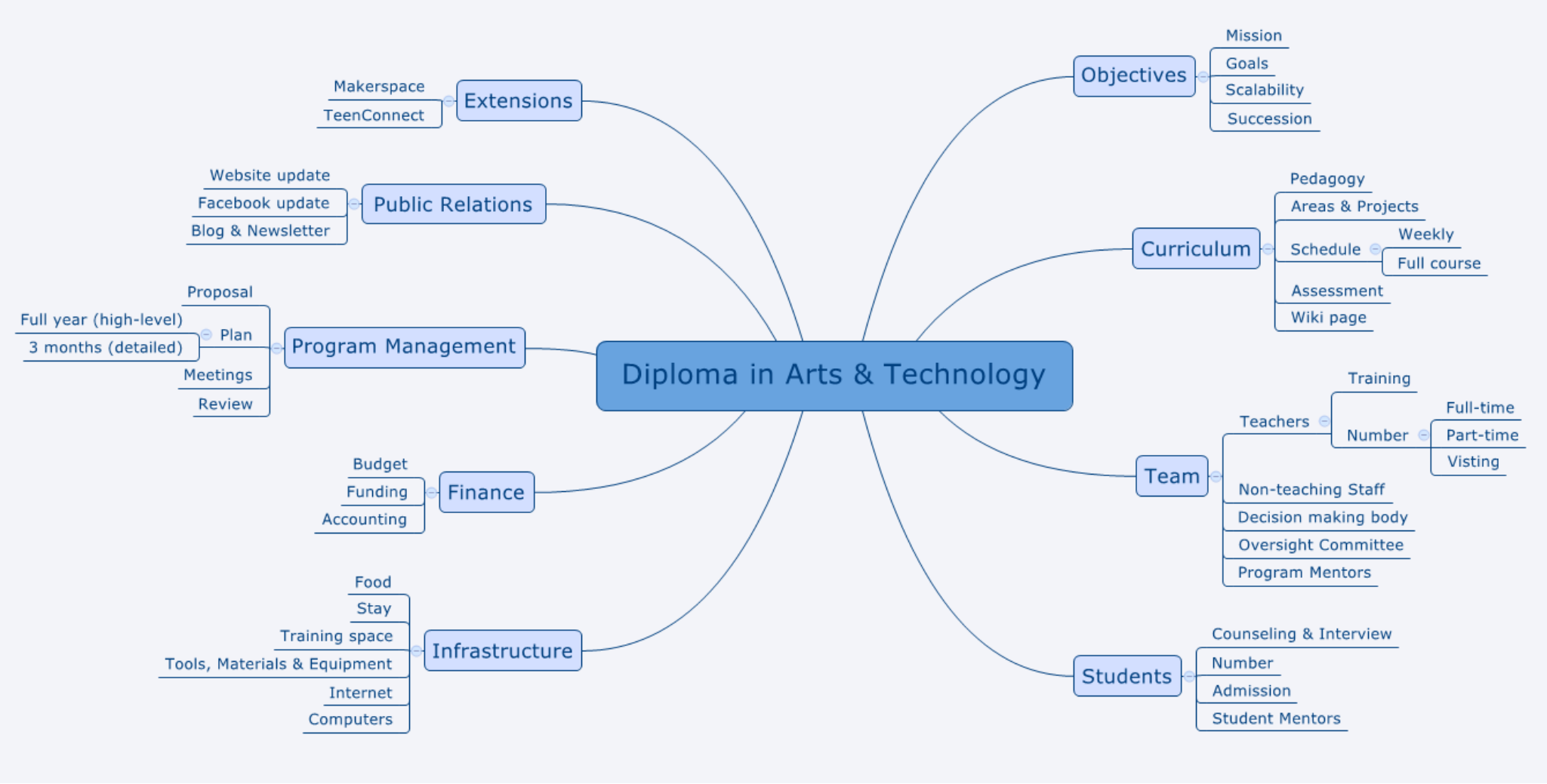
Enable youth to learn to imagine creatively, reason systematically and learn continuously, to confidently interact with the outside world and possibly become anchors in their community by exposing them to various skills and knowledge while staying rooted in their values

Goals

1. Learning by making, tinkering and engineering different things using a variety of traditional and cutting-edge tools and materials
2. Enhance abilities for adaptive and positive behavior that can enable them to deal effectively with the demands and challenges of everyday life
3. Foundation on Mathematical and Computational Thinking, Communicative English and Tamil, Finance and Health, possibly linked to 10th standard academics
4. Strong relationship with the students during and after the course, providing them all kinds of support
5. External apprentice or skill training (short-term or part-time). Locally relevant agri-culture
6. Sound analysis of the strengths and challenges of the community and possible solutions
7. Exposure visits, Opportunities to interact with outside world
8. Learning by teaching others through outreach programs. Exhibitions to showcase work
9. Pedagogy suited to the needs of the students. Teachers co-learn with students
10. Not to nurture the next Mozart or Einstein, but to help students become better in the ways they deal with everyday problems.

Course Duration: 1 year

Bird’s-eye view



Drawn with XMind

Pedagogy

- Students will learn the same way that MIT learns.. (and Vidyodaya learns, as learning should be)
- Learning process and methods strongly rooted in adivasi community, solutions and practices from their traditions and values, integrated with daily life
- Our approach is based on four guiding principles:
  - **Projects**: We learn best when we are actively working on projects - generating new ideas, designing prototypes, making improvements and creating final products.
  - **Collective (Peers)**: Learning flourishes as a social activity, with people sharing ideas, collaborating on projects, and building on one another's work.
  - **Passion**: When we focus on things we care about, we work longer and harder, persist in the face of challenges, and learn more in the process.
  - **Play**: Learning involves playful experimentation - trying new things, tinkering with materials, testing boundaries, taking risks, iterating again and again
- Types of projects
  - Defined process and a defined outcome solely to teach one or more skills
  - Defined outcome and uses skills learned from skill builders in an undefined process
  - Open-process, Open-outcome project—essentially creating whatever the students want to create

"We don't say that they don't have a head for French because we know that if they grew-up in France, they would learn French perfectly well."

"Constructionism and not instructionism"

Integrated Learning

Start simple
Work on things that you like
If you have no clue what to do, fiddle around
Don't be afraid to experiment
Find a friend to work with, share ideas!
It's OK to copy stuff (to give you an idea)
Keep your ideas in a sketch book
Build, take apart, rebuild
Lots of things can go wrong, stick with it

"Use what we are learning today, and not 12 years later"

"Not to fabricate toy situations to teach specific concepts, but rather the concepts emerge due to need to make their own projects succeed"

Teachers learn with students.. Less of masters bossing around..

Exploration Areas

Areas	Specifics
Agri-culture	▪ Local vegetables, crops, poultry, machinery ▪ Take up land around school (and the new land?)
Computational & Mathematical thinking	▪ Programming through Scratch, Microworlds EX ▪ Real-world math simulations through Matific
Physical computing	▪ Electrical, Electronics, Makey Makey, Picoboard + CAD ▪ Microcontrollers (Arduino), Microcomputers (Raspberry Pi) ▪ Robotics (Lego Mindstorms), Wearable Computing (Lilypad)
Textiles	▪ Tailoring, Knitting, Embroidery, Wearable Electronics
Interdisciplinary	▪ Physical computing, Bamboo, Wood working, Metal working?, Textiles, Construction, Plumbing ▪ CAD, howtoons.com, instructables.com, arvindguptatoys.com, Shanker Science Experiments ▪ Projects: Daily activities of the institution (ex: kitchen needs)
Art and craft (including Adivasi)	▪ Drawing & Painting (+walls), Music, Dance, Theatre, Puppet, Movies, Paper/Cardboard artefacts
Apprentice	▪ Areca nut plate making, On-campus shop, Ecoscape, Cycle repair, Soap making, Shola Trust
Home Science	▪ Nutritious cooking, Health, Personal finance, Shopping, (visual IQ, simple puzzles)
Adivasi knowledge	▪ Adivasi Struggle, Traditional culture and values, local geography, knowledge of local wild life, Community work, Village survey (Open Street Map) ▪ Documentary on Adivasi Past, Present & Future – strengths, challenges & overcoming them
Exposure visits	▪ Cycle rides, Organizations in our network (RLHP, Sholai, etc), Outreach programs in community
Expert/Guest projects	▪ Solar, Photography, Land survey/mapping, Websites, Yoga?, CCTV,
Life skills, **Leadership & Communication**	▪ Social, thinking and emotional skills ▪ Mixture of Native language, Tamil and English ▪ Document projects using computers, pictures/videos, visual communication ▪ Read, Write, Tell stories, role play, interesting news, presentations, debate
Games	▪ Indoor & Outdoor, Traditional & Modern
Digital fabrication (for later consideration)	▪ Vinyl cutter, Laser cutter, 3D printer, CNC mill/router

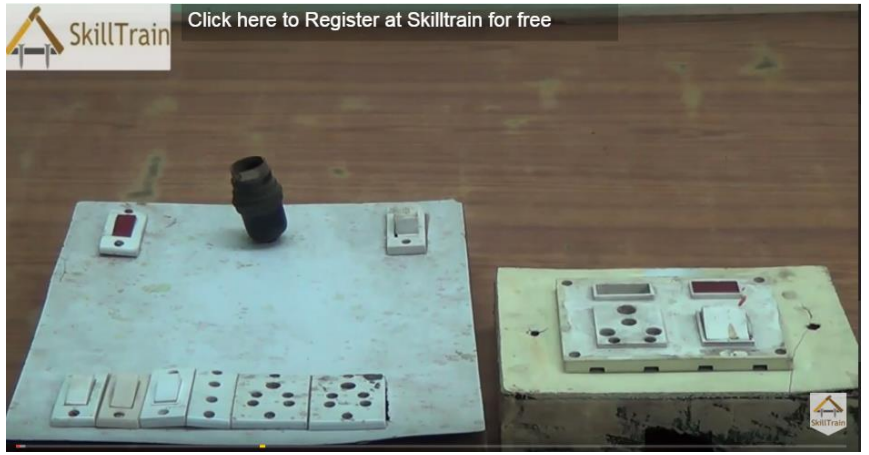
Sample projects

Agri-culture

- Technical help from Subhash and Smitha
- One of the tribal teachers to take lead on this
- Local vegetables, fruits, crops, poultry
  - Students to survey and find out what to grow and how to grow
- Take up land around school (the new land?)
- Operation of weeding machine, pruning machine, tea picking machine

Electrical

Bulbs – Series/Parallel



Building a real circuit board

Fiddling with existing circuit board

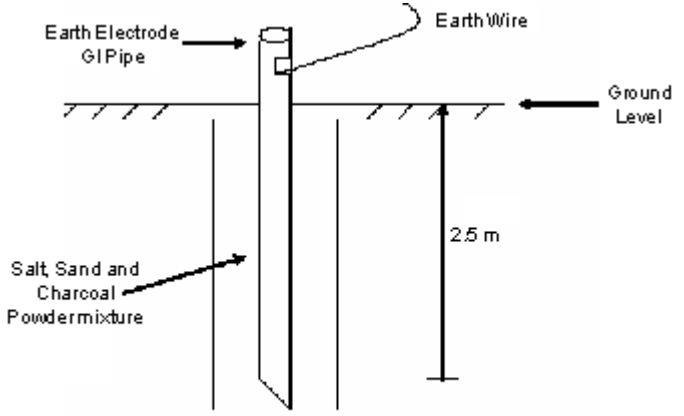


Fig. 2.3 : Earth electrode

Earthing

Electronics

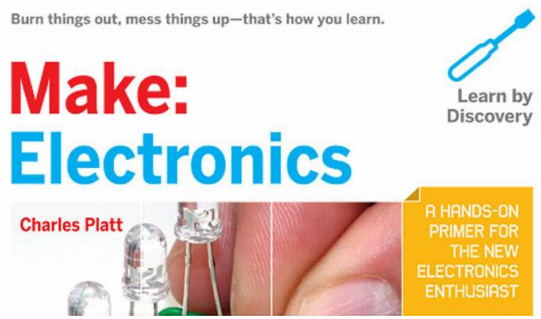


Figure 5-65. *The simple pleasure of picking up a radio signal with ultra-simple components and no additional power.*

Learning by Discovery

Most introductory guides begin with definitions and facts, and gradually get to the point where you can follow instructions to build a simple circuit.

This book works the other way around. I want you to start putting components together right away. After you see what happens, you'll figure out what's going on. I believe this process of *learning by discovery* creates a more powerful and lasting experience.

Learning by discovery occurs in serious research, when scientists notice an unusual phenomenon that cannot be explained by current theory, and they start to investigate it in an effort to explain it. This may ultimately lead to a better understanding of the world.

We're going to be doing the same thing, although obviously on a much less ambitious level.

Along the way, you will make some mistakes. This is good. Mistakes are the best of all learning processes. I want you to burn things out and mess things up, because this is how you learn the limits of components and materials. Since we'll be using low voltages, there'll be no chance of electrocution, and so long as you limit the flow of current in the ways I'll describe, there will be no risk of burning your fingers or starting fires.

How Hard Will It Be?

I assume that you're beginning with no prior knowledge of electronics. So, the first few experiments will be ultra-simple, and you won't even use solder or prototyping boards to build a circuit. You'll be holding wires together with alligator clips.

Very quickly, though, you'll be experimenting with transistors, and by the end of Chapter 2, you will have a working circuit that has useful applications.

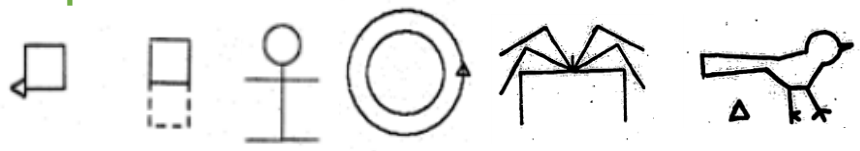
I don't believe that hobby electronics has to be difficult to understand. Of course, if you want to study electronics more formally and do your own circuit design, this can be challenging. But in this book, the tools and supplies will be inexpensive, the objectives will be clearly defined, and the only math you'll need will be addition, subtraction, multiplication, division, and the ability to move decimal points from one position to another.

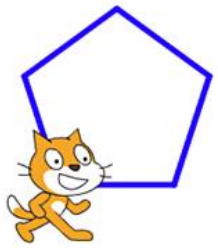
Computational Thinking

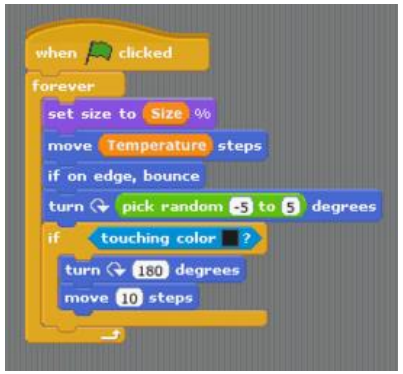
Scratch is a free visual programming language. Scratch is used by students, scholars, teachers, and parents to easily create animations and provide a stepping stone to the more advanced world of computer programming. It can also be used for a range of educational and entertainment constructionist purposes from math and science projects, including simulations and visualizations of experiments, recording lectures with animated presentations, to social sciences animated stories, and interactive art and music.

Scratch allows users to use event-driven programming with multiple active objects called sprites.[1] Sprites can be drawn, as vector or bitmap graphics, from scratch in a simple editor that is part of Scratch, or can be imported from external sources, including webcams. (Also Microworlds EX from LSCI)

Let students experiment on their own to program the computer to draw different shapes with a few simple commands



Code Blocks	Output
repeat 5 move 100 steps wait 1 secs turn 360 / 5 degrees wait 1 secs This code sequence draws a regular pentagon and uses a green operator block expressiing the rule of the sum of exterior angles.	



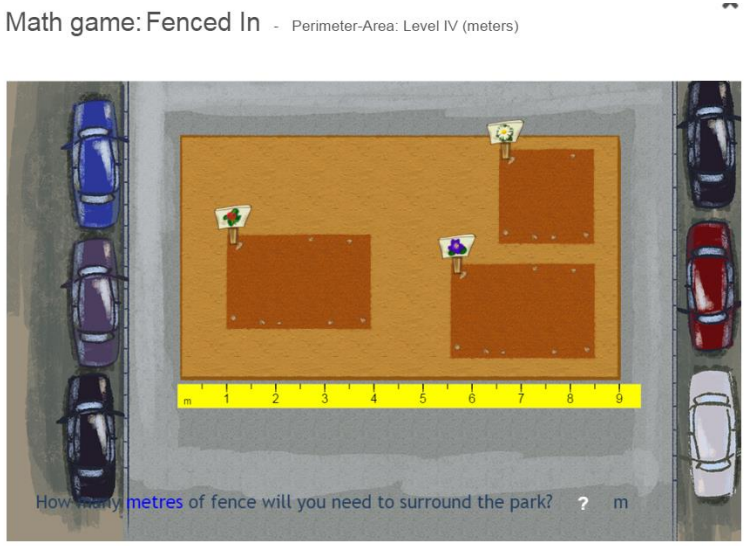
Extend with more complex commands and projects

Scratch Commands by Category

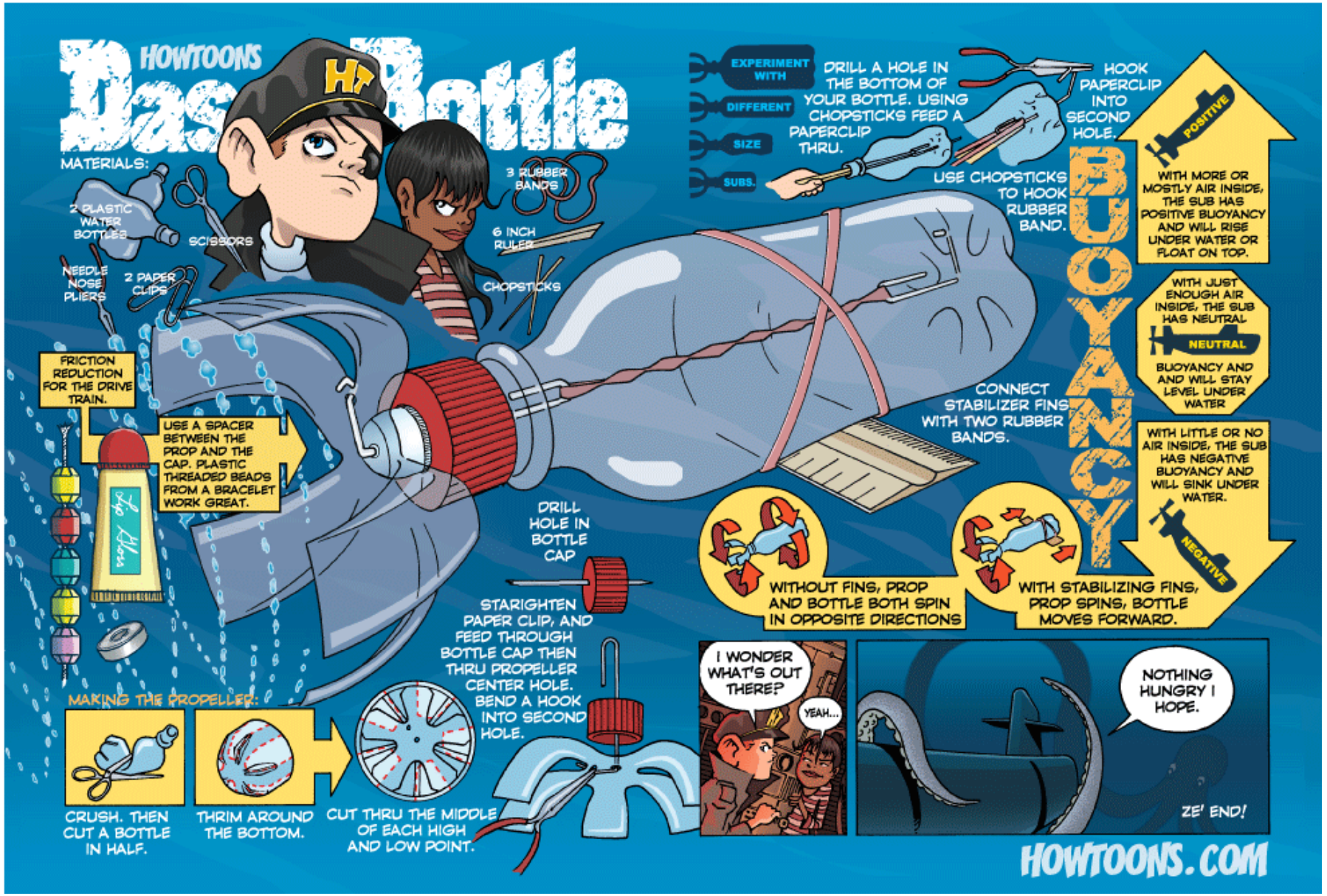
move □ steps	Motion		when green flag clicked	Control
turn □ degrees	Motion		when □ key pressed	Control
point in direction □	Motion		when sprite 1 clicked	Control
point towards □	Motion		wait □ secs	Control
go to x: □ y: □	Motion		forever	Control
go to □	Motion		repeat □	Control
glide □ secs to x: □ Y: □	Motion		broadcast □	Control
change x by □	Motion		broadcast □ and wait	Control
set x to □	Motion		when I receive □	Control
change y by □	Motion		forever if □	Control
set y to □	Motion		if □	Control
if on edge, bounce	Motion		if □ else	Control
			wait until □	Control
switch costume to □	Looks		repeat until □	Control
next costume	Looks		stop script	Control
say □ for □ secs	Looks		stop all	Control
think □ for □ secs	Looks			
change color effect by □	Looks		touching □	Sensing
set color effect to □	Looks		touching color □	Sensing
clear graphic effects	Looks		color □ is touching □	Sensing
change size by □	Looks		ask □ and wait	Sensing
set size to □ %	Looks		mouse x	Sensing
show	Looks		mouse y	Sensing
hide	Looks		mouse down	Sensing
go to front	Looks		key □ pressed	Sensing
go back □ Layers	Looks		distance to □	Sensing
			reset timer	Sensing
play sound □	Sound		□ of □	Sensing
play sound □ until done	Sound		□ sensor value	Sensing
stop all sounds	Sound		sensor □	Sensing
play drum □ for □ beats	Sound			
rest for □beats	Sound		□ + □	Operators
play note □ for □ beats	Sound		□ - □	Operators
set instrument to □	Sound		□ * □	Operators
change volume by □	Sound		□ / □	Operators
set volume to □ %	Sound		pick random □ to □	Operators
change tempo by □	Sound		□ < □	Operators
set tempo to □ bpm	Sound		□ = □	Operators
			□ >□	Operators
clear	Pen		□ and □	Operators
pen down	Pen		□ or □	Operators
pen up	Pen		not □	Operators
set pen color to □	Pen		join □ □	Operators
change pen color by □	Pen		letter □ of □	Operators
change pen shade by □	Pen		length of □	Operators
set pen shade to □	Pen		□ mod □	Operators
change pen size by □	Pen		round □	Operators
set pen size to □	Pen		□ of □	Operators
stamp	Pen			
			make a variable	Variables
			make a list	Variables

Mathematical Thinking

- Simulations of real-world problems using computers.
- Intuitive ways to understand concepts.
- Students experiment with different solutions.

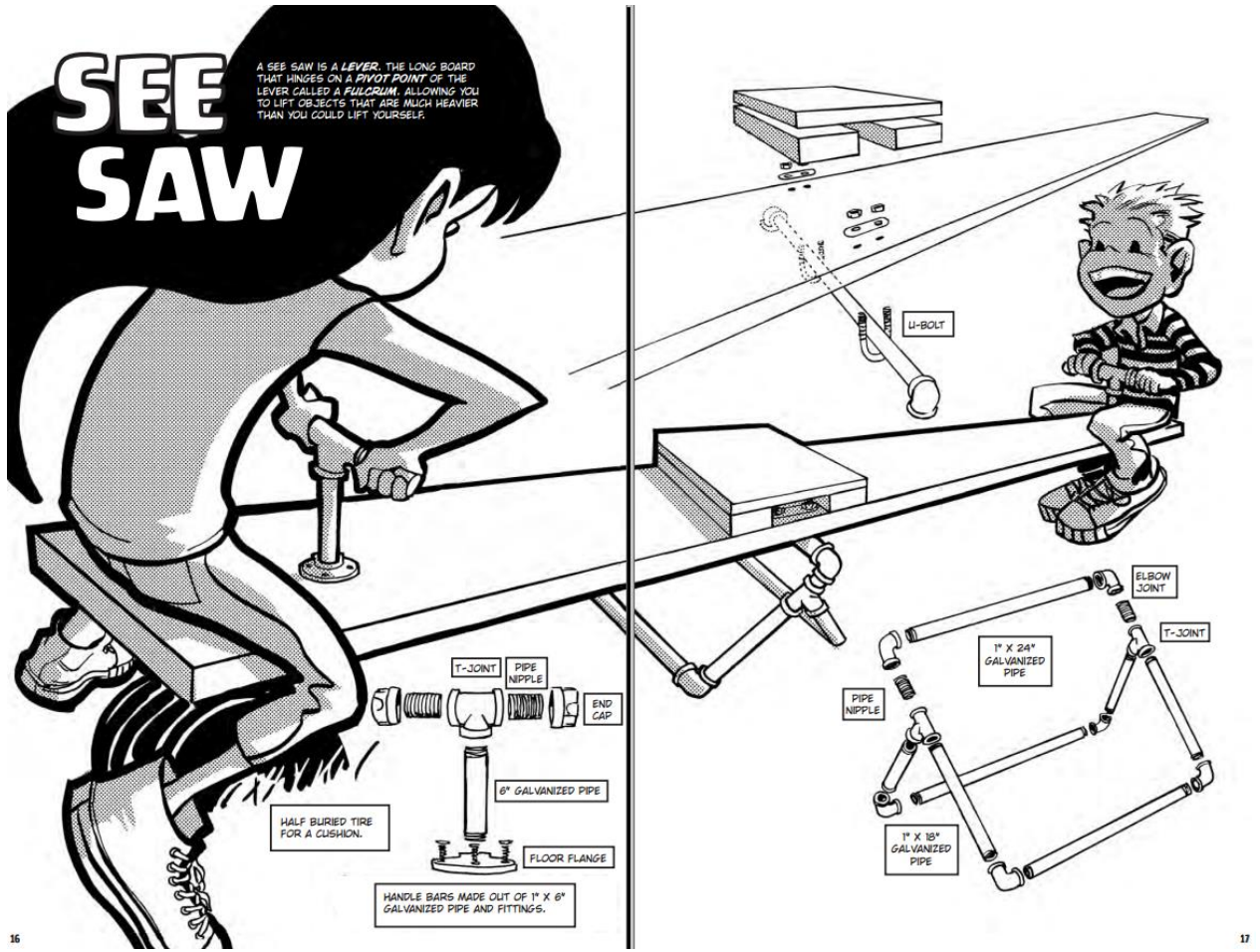


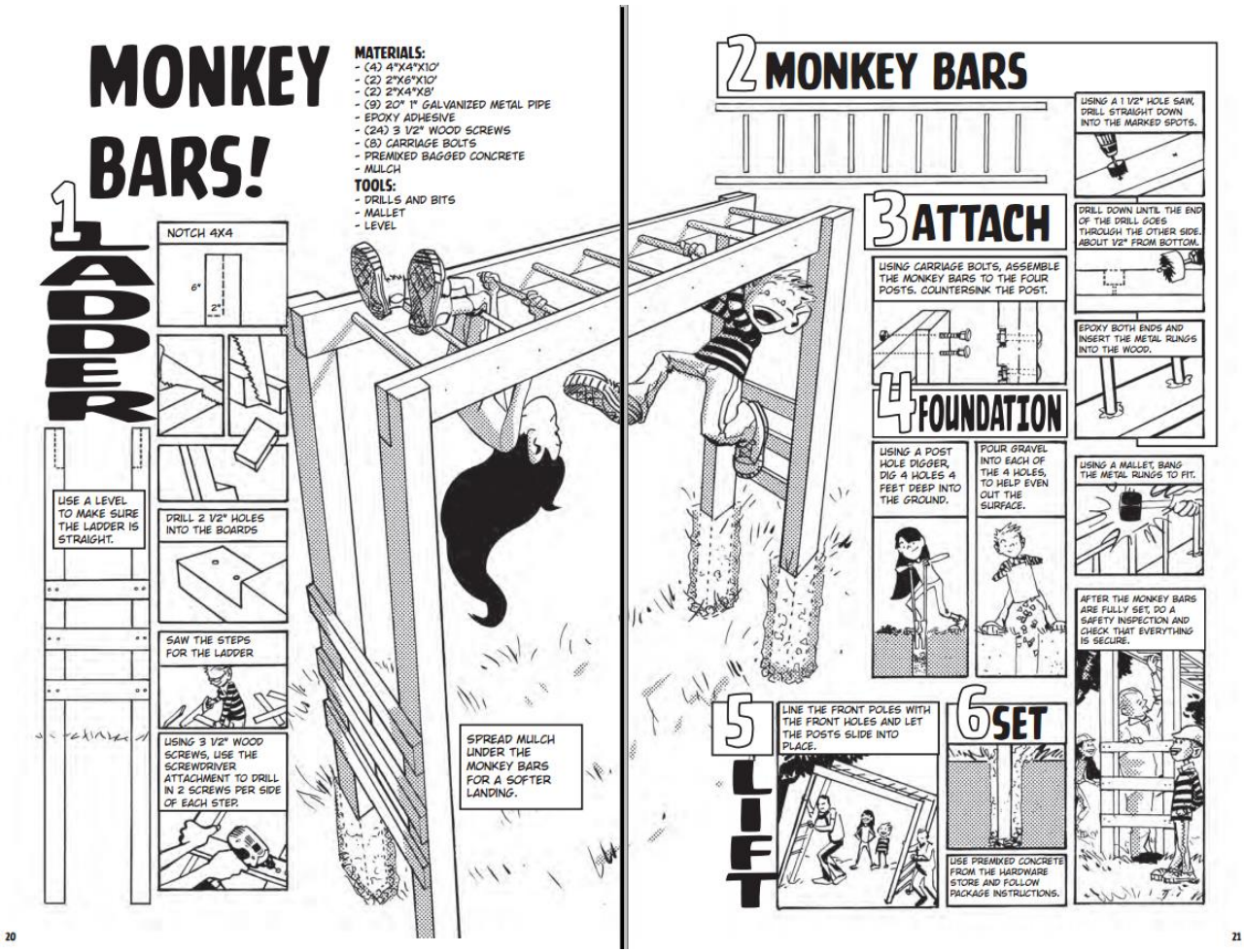
Soda Bottle Sub



Playground

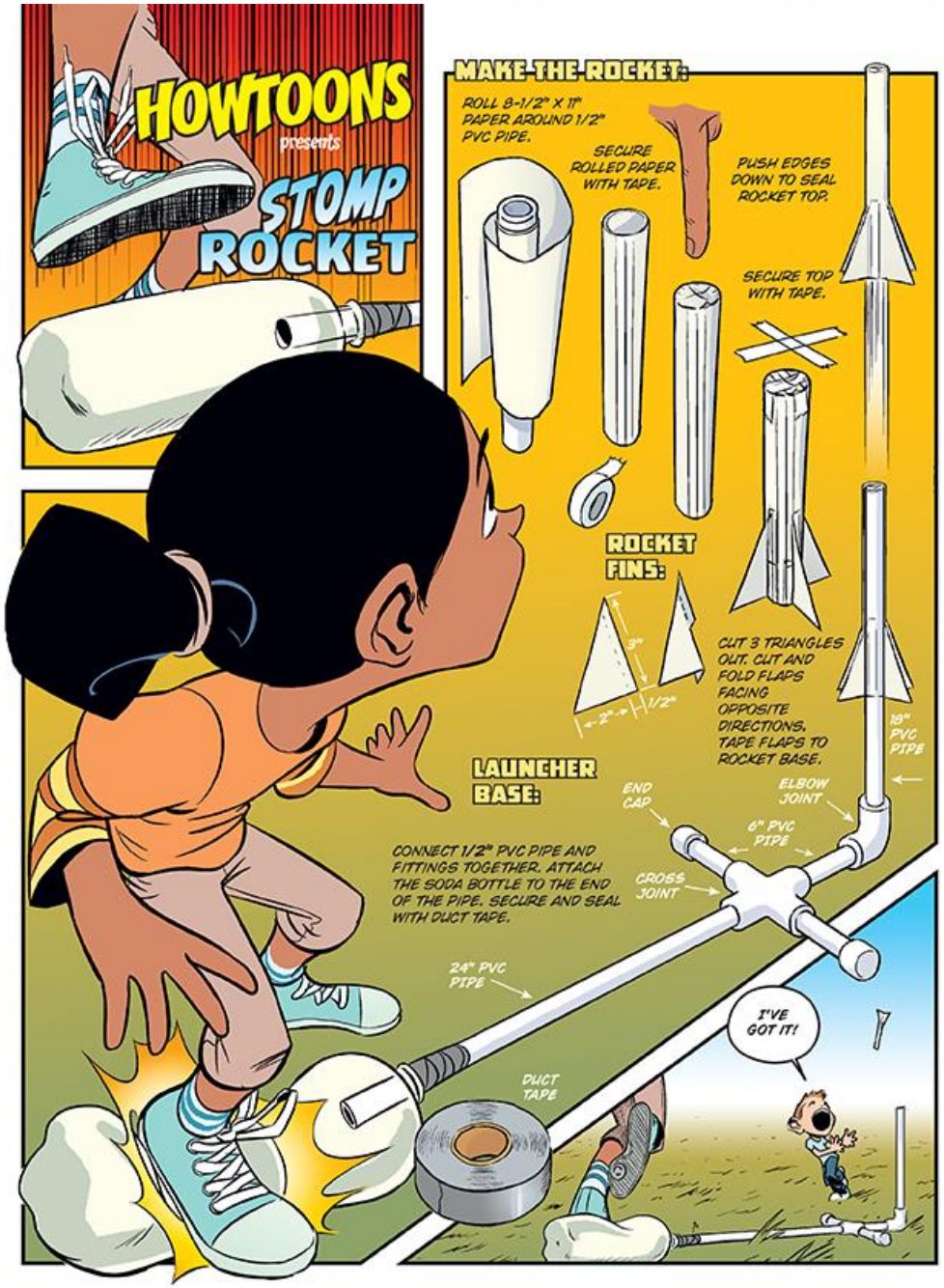
Howtoons
Playground Maker



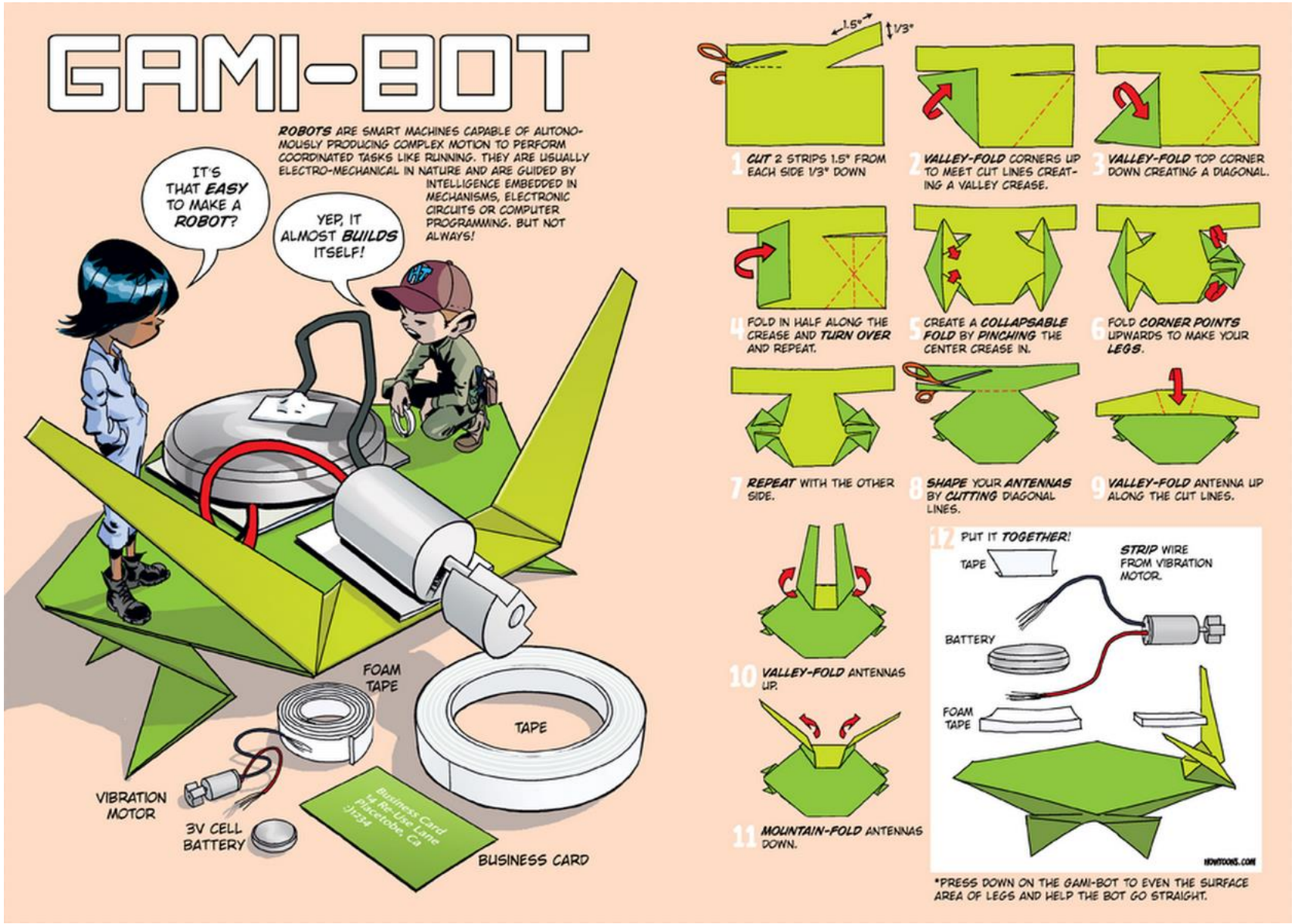


Can we do this with bamboo?

Stomp Rocket



Gami-bot


GAMI-BOT
ROBOTS ARE SMART MACHINES CAPABLE OF AUTONOMOUSLY PRODUCING COMPLEX MOTION TO PERFORM COORDINATED TASKS LIKE RUNNING. THEY ARE USUALLY ELECTRO-MECHANICAL IN NATURE AND ARE GUIDED BY INTELLIGENCE EMBEDDED IN MECHANISMS, ELECTRONIC CIRCUITS OR COMPUTER PROGRAMMING. BUT NOT ALWAYS!
IT'S THAT EASY TO MAKE A ROBOT?
YEP, IT ALMOST BUILDS ITSELF!
FOAM TAPE
TAPE
VIBRATION MOTOR
3V CELL BATTERY
BUSINESS CARD
1.5"
1/3"
1 CUT 2 STRIPS 1.5" FROM EACH SIDE 1/3" DOWN
2 VALLEY-FOLD CORNERS UP TO MEET CUT LINES CREATING A VALLEY CREASE.
3 VALLEY-FOLD TOP CORNER DOWN CREATING A DIAGONAL.
4 FOLD IN HALF ALONG THE CREASE AND TURN OVER AND REPEAT.
5 CREATE A COLLAPSABLE FOLD BY PINCHING THE CENTER CREASE IN.
6 FOLD CORNER POINTS UPWARDS TO MAKE YOUR LEGS.
7 REPEAT WITH THE OTHER SIDE.
8 SHAPE YOUR ANTENNAS BY CUTTING DIAGONAL LINES.
9 VALLEY-FOLD ANTENNA UP ALONG THE CUT LINES.
10 VALLEY-FOLD ANTENNAS UP.
11 MOUNTAIN-FOLD ANTENNAS DOWN.
12 PUT IT TOGETHER!
TAPE
STRIP WIRE FROM VIBRATION MOTOR.
BATTERY
FOAM TAPE
HOWTOONS.COM
*PRESS DOWN ON THE GAMI-BOT TO EVEN THE SURFACE AREA OF LEGS AND HELP THE BOT GO STRAIGHT.

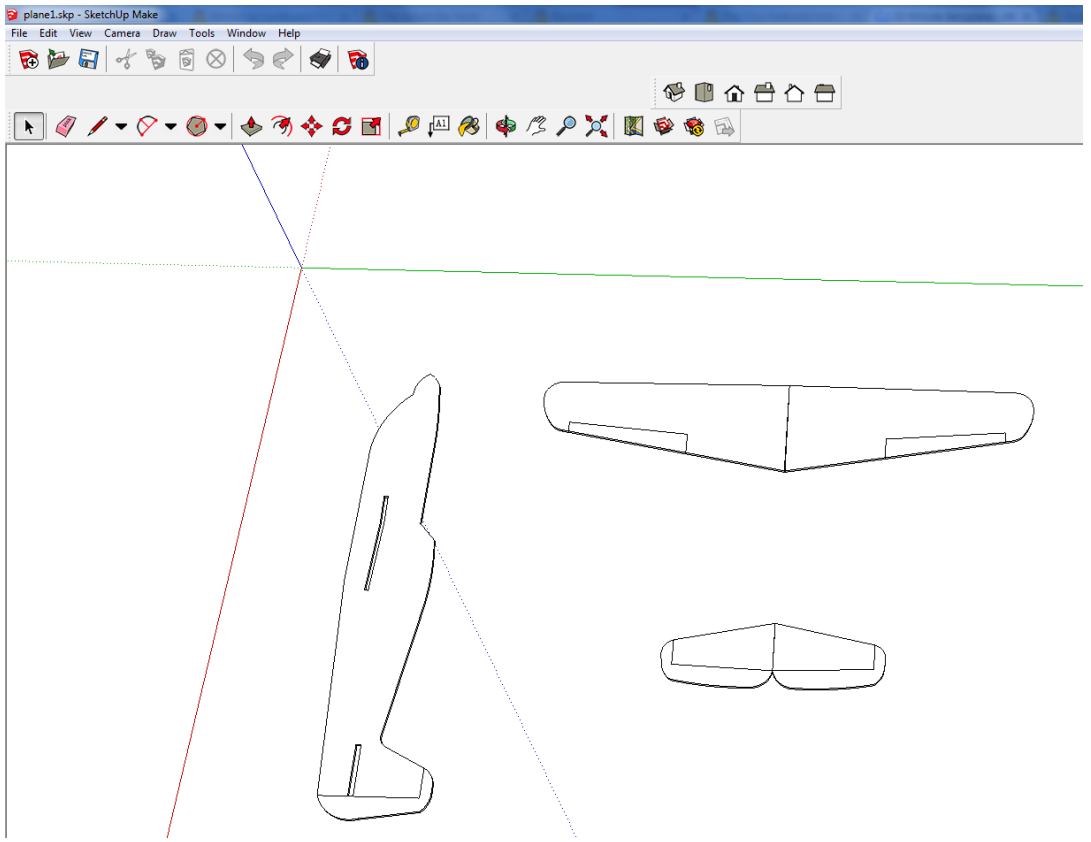
Rocking Elephant

6. Select the appropriate settings for your jigsaw.

7. Carefully cut around the cut line.

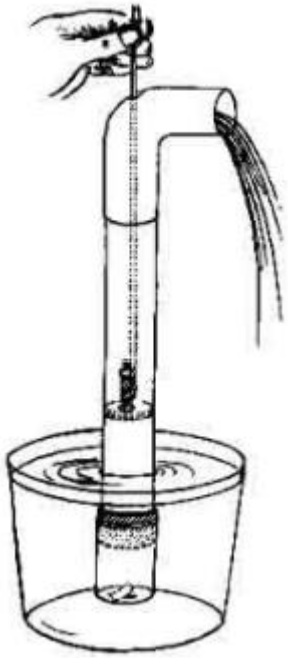
8. Use a drill and a 22mm Forstner or cantilever hinge and drill the hole for the eyes and tusks. Use a different diameter as your plastic tube wider or narrower than 22mm.

Foam Aeroplane

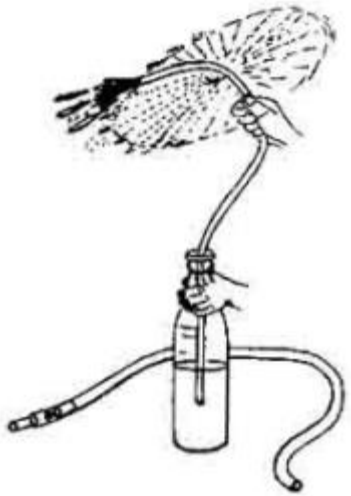


Pumps & Valves

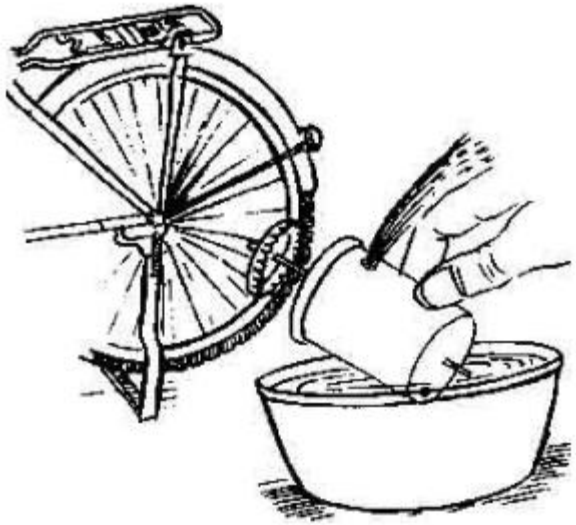
Toothpaste Tube Pump



Tube Pump



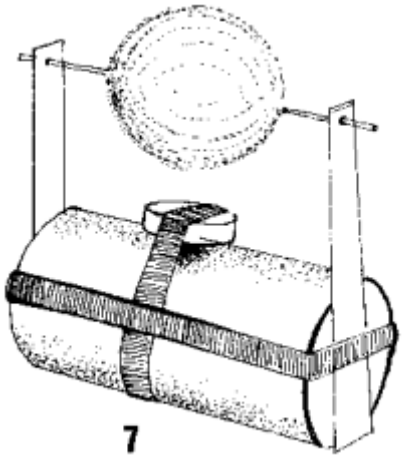
Sprinkler



Rotary Pump

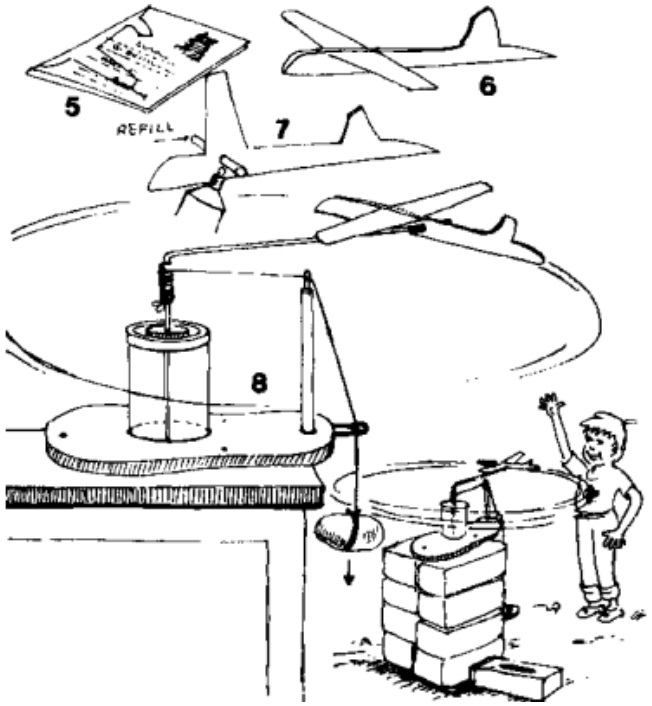
Books, Videos, Step by step pictures

More..

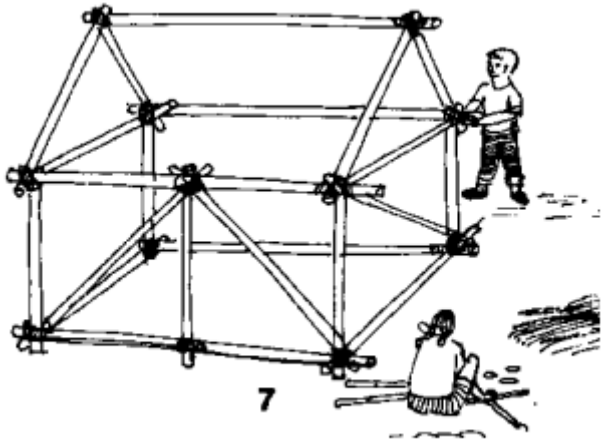


MOTOR

ROTATING FAN



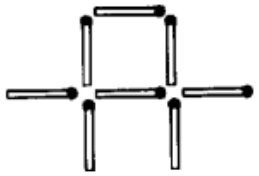
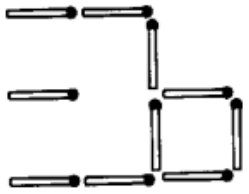
CIRCLING AIRPLANE



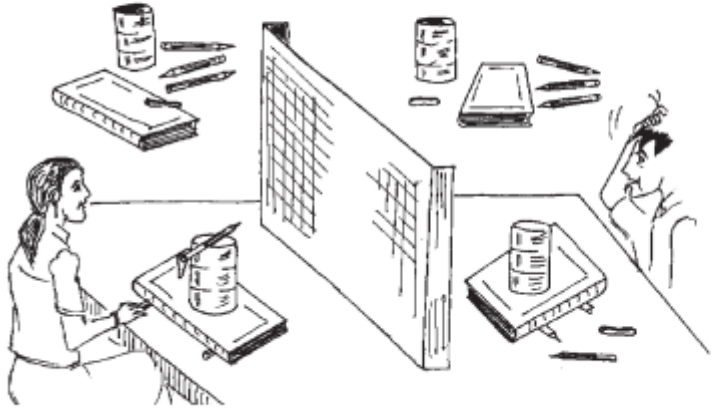
REED STRUCTURES

MATCHSTICK MATCHING

Move only as many matches as directed and create as many squares as requested.
(Squares can overlap or have corners in common.)

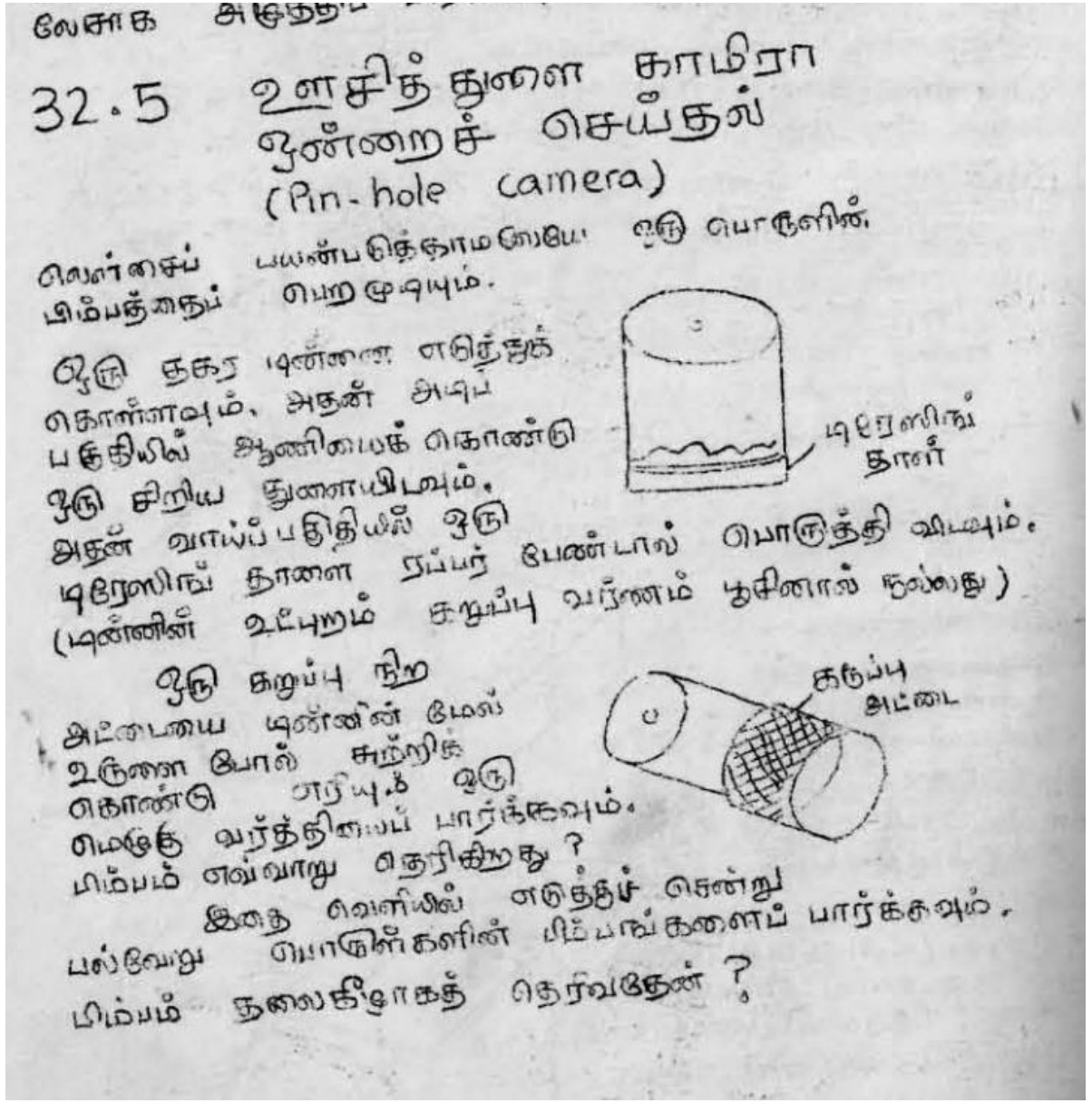
	CHANGE 2 STICKS	CHANGE 3 STICKS	CHANGE 4 STICKS
MAKE 2 SQUARES			

Following Instructions



How good are we at giving and following precise and unambiguous instructions? This lovely activity tests this out. Two players sit across a table with a screen between them. Both are given the same set of objects—exactly the same. In the picture the girl puts these things one by one in a pattern. While arranging she also explains her actions in words to her partner. Her partner cannot see her arrangement but has to follow her instructions and make a similar arrangement. This is often not very easy. You will be absolutely surprised at the goof ups! This activity develops an ability to communicate precisely without mincing words. After finishing one round the partners reverse roles.

Pin-hole camera



32.5 ஒளித் துளை காமிரா ஒன்றைச் செய்தல் (Pin-hole camera)

வெள்ளைப் பிம்பத்தைப் பயன்படுத்தாமலேயே ஒரு பொருளின் பிம்பத்தைப் பெற முடியும்.

ஒரு நகர முன்னை எடுத்துக் கொள்ளவும். அதன் அடிப பகுதியில் ஆணியைக் கொண்டு ஒரு சிறிய துளையிடவும். அதன் வாய்ப் பகுதியில் ஒரு டிரேஸிங் தாளை ரப்பர் பேண்டால் பொருத்தி விடவும். (முன்னின் உட்புறம் கருப்பு வர்ணம் தூசினால் நல்லது)

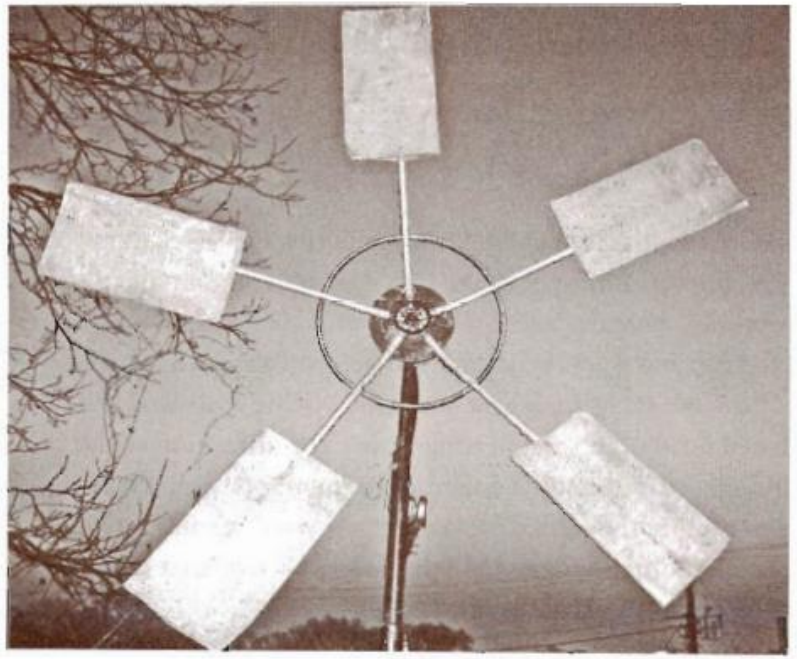
ஒரு கறுப்பு நிற அட்டையை முன்னின் மேல் உருளை போல் சுற்றிக் கொண்டு எரியும் ஒரு மெழுகு வர்த்தியைப் பார்க்கவும். பிம்பம் எவ்வாறு தெரிகிறது?

இதை வெளியில் எடுத்துச் சென்று பல்வேறு பொருள்களின் பிம்பங்களைப் பார்க்கவும். பிம்பம் நலைகீழாகத் தெரிவதேன்?

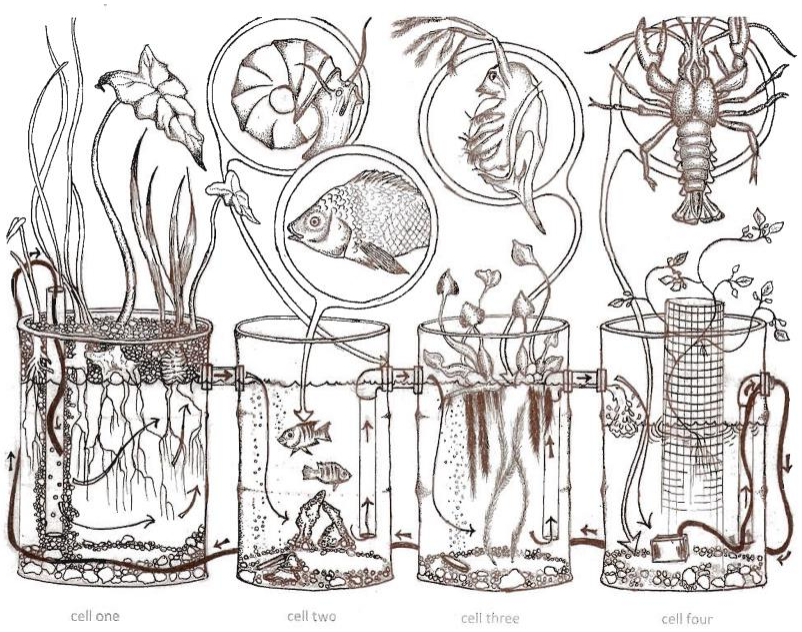
Engraving with a power rotary tool

- Costs about INR 2000-10000
- Bosch Power Tools has shown interest to donate their demo tools.

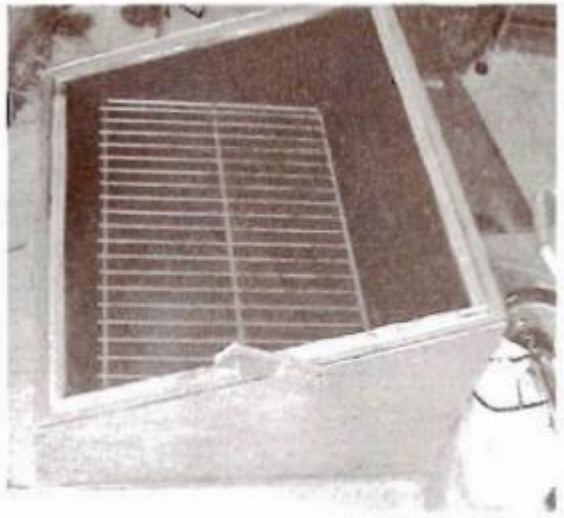
Sustainability related projects



Wind turbines with recycled parts



Intensive recirculating systems



Solar oven

Rocket stove

http://www.rivendellvillage.org/Toolbox_For_Sustainable_City_Living.pdf

Weaving

Logistics

Team & Time table

Standby Time table								
		Mon	Tue	Wed	Thu	Fri	Sat	Sun
6:00	6:30	Morning session						Free day
6:30	7:00							
7:00	7:30	Get ready						
7:30	8:00							
8:00	8:30							
8:30	9:00	Breakfast						
9:00	9:30	1	Assignments			2	3	
9:30	10:00							
10:00	10:30							
10:30	11:00	Break						
11:00	11:30	4	5	6	7	8	9	
11:30	12:00							
12:00	12:30	10	11	12	13	14	15	
12:30	1:00							
1:00	1:30	Lunch						
1:30	2:00							
2:00	2:30	Maker sessions (Interdisciplinary projects, Art & Craft)						
2:30	3:00							
3:00	3:30							
3:30	4:00							
4:00	4:30							
4:30	5:00	Games?						
5:00	5:30							
5:30	6:00							
6:00	6:30	Assignments						
6:30	7:00							
7:00	7:30							
7:30	8:00							
8:00	8:30	Dinner						
8:30	9:00							

Areas	En	Time slot
Agri-culture	**V**	Yet to decide
Computational & Mathematical thinking	**V**	#1 to #15
Physical computing	**V**	#1 to #15
Textiles	**V**	Maker
Interdisciplinary	**V/B**	Maker
Art and craft (inc Adivasi)	**B**	Maker
Apprentice	**V**	On availability
Home Science	**B**	Maker
Local knowledge	**B**	#1 to #15
Exposure visits	**V**	On availability
Expert/Guest projects	**V**	On availability
Life skills, Leadership & Communication	**B**	#1 to #15
Games	**B/X**	Games
Digital fabrication (for later consideration)		Later

On the ground team	
Bhuvana	Part-time
Chandran	Full-time
Vinoth	Part-time
Senior girl (To find)	Full-time
Junior girl (To find)	Full-time
Senior boy (To find)	Full-time
Core team for Teen support	
Bhuvana	
Kathiravan	
Parvathi Ponnani	
Vinoth	
Vishnu	
Advisors	
Ramdas	
Stan	
Gangatharan	
Experts	
Subhash/Smitha	Agri
Durga	English
Veena	Maths
Guests	
Srikanth	
Sumika	
Nandakumar	

Key References

- Thulir, Vigyan Ashram, Workbench Projects, Dream a Dream
- “Invent to Learn: Making, Tinkering, and Engineering in the Classroom”, book by Gary Stager and Sylvia Libow Martinez
- Works of Seymour Papert, his disciples, MIT media lab
- http://pinterest.com/vethiraj/pins/

More..

Adivasi Values

- Living as a Community
  - Collective and co-operative ways of working and living
  - Equality. Egalitarianism by structure and not accident
  - Have resolved the conflict between collective good versus individual desire.
  - Sharing within the community through built in practices
- Living with nature
  - Closeness and interdependence with nature
  - As part of nature rather than subdue it
- Living with contentment
  - Feeling content with what they have
  - No accumulation, hoarding or decide to acquire
  - No concept of proprietary
- Living in the present
  - Concept of time is circular and not measured or linear.
  - Work based on the cycle of seasons, prepare just for 1 season ahead
  - Don’t track time

Would like donor support on.. (work in progress)

https://in.pinterest.com/vethiraj/adivasi-dat-wishlist/
http://www.amazon.com/registry/giftlist/1LVD1OXQWVWPH

Papert LEGO with Adjudicated Youth