GOSH day 2

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First session: education — Arduino not so accessible...

Poster: "open science school.org" – Paris — do water quality monitoring

2nd session: developing world (majority world)

- various backgrounds – education (eg. webcam microscope) @school age
  - public health, open access
  - bio hack: PCR diagnosis??

(?) How do we establish credability of OSH?
- ↳ let someone sell it as a product ← Business Model — retr3d (Tech for trade)
- ↳ Government? ← case studies matter a lot — More: examples?
- ↳ Sci. Research

David (University Arabs of Chile) – established maker space – funded with a business development remit
also school age sessions

(?) How can we encourage the majority world to contribute not just adapt?
↳ saw this happening @ STICLabs: how to document & share?

- "Ancestral Knowledge"

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Afternoon #1: Upscaling

Tactics:
- Workshops
- Sell a product (backyard brains)
- Co-design
- Word of mouth
- Key people - influencers/enthusers
- Find organisational partners w/shared goals
- Road map & milestones
- Mass media / social media
- Online community building
- Funding
- Modularity (split into smaller/easier/independently useful products)
- UX for new users
- Explicitly welcoming → "onboarding"
- Target specific groups (why is this interesting?)

"Kits & Products"

- Barriers
  - money (up-front cost of production)
  - regulations → "minimum viable kit" approach ↳ GOSH resources
  - sourcing
  - sales

- community vs customer

sourcing → GOSH resources "

sales

instructions & ease of assembly

after-sales support — community vs customer "build a tribe"

manage expectation

quality control / expectation ↔ β-testing?

required skills

difficulty level

production vs prototyping

how useful is it?

validation / calibration

- Acceptance / advertising — distinction between "science grade" and "hobbyist" valuable
  - how about "calibrated" vs "uncalibrated"
- Production / manufacturing — often not very open process
  - (just pay a company)
  - what is the cost involved
  - how do you manage tooling / set-up — does the kit diverge from the development version?
  - do you want to make it yourself or give design to someone else?
  - sales & distrn logistics
  - CNC as an alternative

→ can we make a roadmap with examples of success → let's do this!

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↳ Onboarding (group report back) — the process of welcoming people in

- ask people to help — with "bite size" problems
  - using social media
  - first-timers only projects
- sharing stories
  - sets role models
- to set up, need to know your target audience — how do you communicate your mission
- you're not just "giving" — set expectations of what you get out

→ We must actively bring people in — or we will grow slowly & have poor diversity

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↳ Communities through workshops — gets repeated by attendees (low bit rate)

- co-creation & ownership — just tell them "please replicate"
  - divergent designs can give ownership
  - include people in organisation
  - does branding discourage ownership
  - how do you stop it only belonging to the creator
- inject into existing community — eg teachers — can be v. challenging
  - institutional hurdles

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## PM #2: Standards

"universal plug & play"

- Standards for interfaces to encourage re-use & avoid re-invention
- Equipment that can take publishable data → is it calibrated? is it quantitative?
- Design constraints
- Standards are important to interact w/ others (electrical engineering background)

- How do you standardise a design - make it consistent?
- Different standards for different regions
- Are standards needed for bio stuff
- Do standards have the same problem as a kit - lock in / ownership

kit but can build your own

Formal or legal standards for manufacturing, sale, certification - and how we deal with that

Legal

Standardising hardware performance and interfaces

Voluntary

(expensive) certification often expensive & closed

do we want our own standards → how could we get this adopted?

interoperability & reuse

Quality control, safety, ethics

interoperability & reuse

Equity & accessibility

standard for centrifuge force
communications protocols
EMI standards

What do standards do

safety
accuracy
best practice
compatibility

→ c.f. roadmap for the "idea-to-product process: could we have a flowchart for which standards you need to hit, with helpful hints/examples/contacts?

Action

Action Does GOSH need a standards group?
→ what standards should we create?

There are some standard bits of kit

- Centrifuge
- Pipette
- Thermocycler
- Microscope

→ map out standards for these?

- Thermocycler
- Microscope

these?
↳ summarise for non-university folk
↳ release implementation - that's as-good-as

shouldn't need to be a journal

library of ~~standard~~ testing protocols

not officially endorsed
allow test protocols to be referenced

create an environment to allow standards to emerge

PCB design

- File formats often not standard/open

3D shapes

is STL enough to be "open"

OSHWA standards for openness

- Recommendations vs Standards - often more appropriate for us?
- Example of open standards: Open Geospatial Consortium vs GEO JSON

took off because of good libraries
↳ grassroots - not from GSC

- where do standards live — GitHub?
  - own server?
- how do you "peer review" hardware
- Political standards (e.g. public lab / health / environment monitoring)
- Sloan report on open hardware standards

(?) How do you define interfaces (e.g. HW control or data sharing) without being too prescriptive (e.g. defining the top-level SW environment)

↳ go for higher level description
↳ standardise data formats

(?) What will we [do]?

review these

↳ Make lists of bio lab standards (Jenny)
↳ Standards are created by the community — we should think about standards & protocols for testing

- Private use of this lab standards (Jenny)
  - Standards are created by the community — we should think about standards & protocols for testing
  - Public Lab working on performance standards
  - Make protocols for our equipment
  - Look at some HW & analyse what needs standardised
  - Establish basic/local working practices → E.g. DropBot
  - Puneet: if I design something, include tests/protocols
    - choose the design that has a test
  - Richard: document my tests explicitly