PROJECT-BASED LEARNING USING AGILE TOOLS

Michigan Career Education Conference

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- Engineering Technology
- Robotics and Automation
- Project Management
  - Systems Engineering in Practice
  - Project Management
  - Marine Technology Capstone
- Project-Based Learning
  - Microcontroller Programming
  - Microcontroller Systems

GOALS

- Why Project-Based Learning (PBL)?
- What is it? - Identify requirements of PBL
- Agile Project Management tools
  - What are they?
  - How do they fit with PBL?
- Examples and Results

THE "IDEAL" GRADUATE

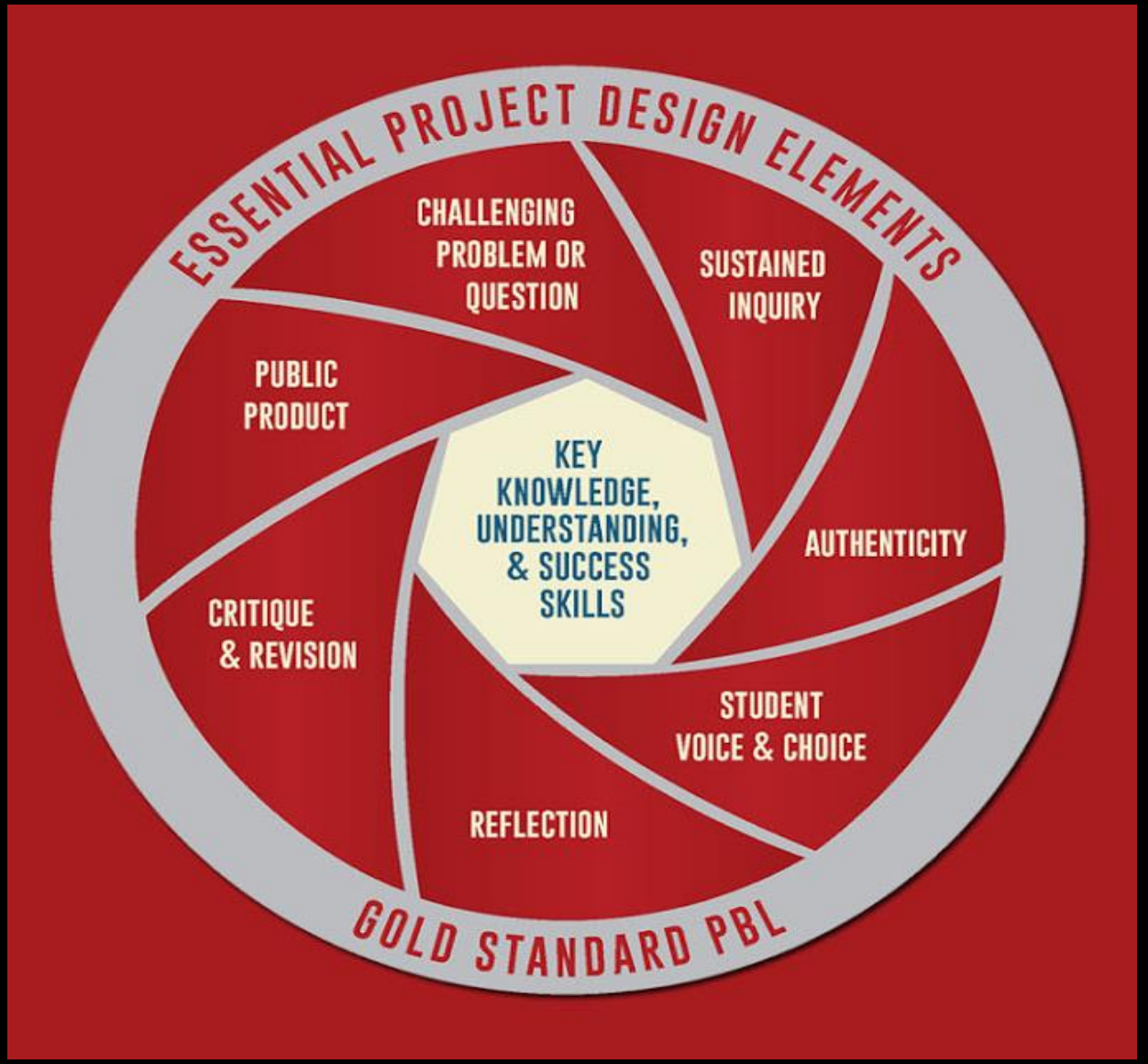
- Critical thinking, problem solver
- Communication – written, verbal, non-verbal
- Works independently or as part of a team
- Manages time and work effectively
- Technology – comfortable with challenge and uncertainty

STUDENT MOTIVATION

Vision without execution is just hallucination

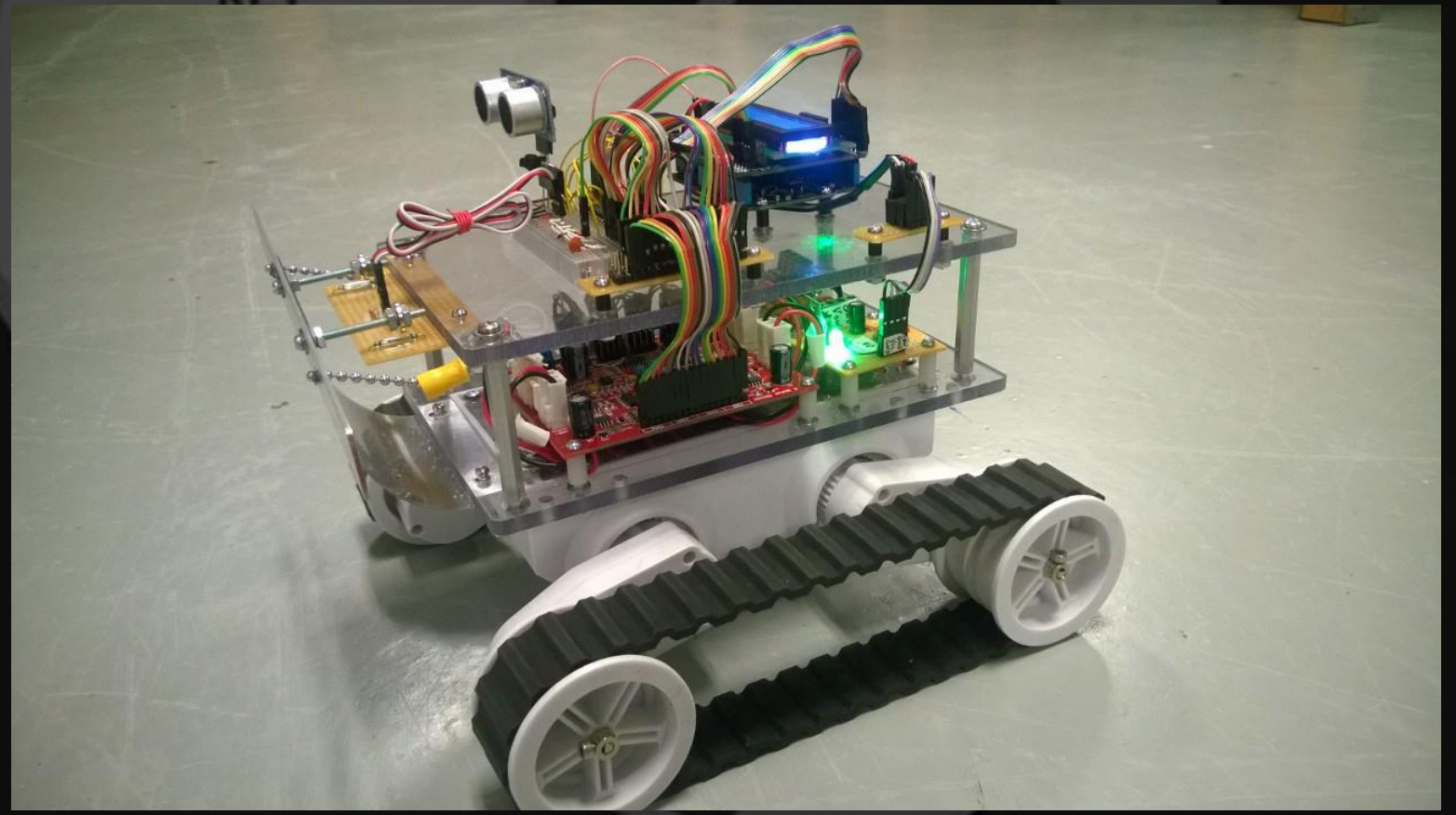
– *Henry Ford*

PBL GOLD STANDARD



CHALLENGING PROBLEM OR QUESTION

Rover Bumper Design



SUSTAINED INQUIRY

Bumper Iterations

Acrylic
Wood
Cardboard

OneNote Online | OneDrive | RAM205 Spring 2018

File | Home | Insert | Draw | View | Print | Tell me what you want to do | Open In OneNote | Give Feedback To Microsoft

RAM205 Spring 2018

- Sprint 1
- Sprint 2
- Sprint 3
- Bumper
- Top Plate
- ServoSonar
- Special

- Bumper notes
  - Phase 1
    - Sketches
    - Orthographic Drawing...
    - Test Documentation a...
    - Mock-ups
  - Phase 2

Objective
Get started on initial thoughts and ideas for bumper design
Make some designs and prototypes

Plan/procedure

- Brainstorm bumper designs
- Draw ideas
- Make prototype (paper)
- Make prototype (cardboard)
- Measure and draw accurately
- Make Q-CAD drawing
- Cut carboard prototype (BOSS)
- Re-design/adjust
- Once cardboard prototype fits, cut acrylic

Design and pix

Owen and I came up with a design which requires the bumper to be in two pieces, right and left. Four switches will act as indicators of where the obstacle is and communicate to the rover what to do next.

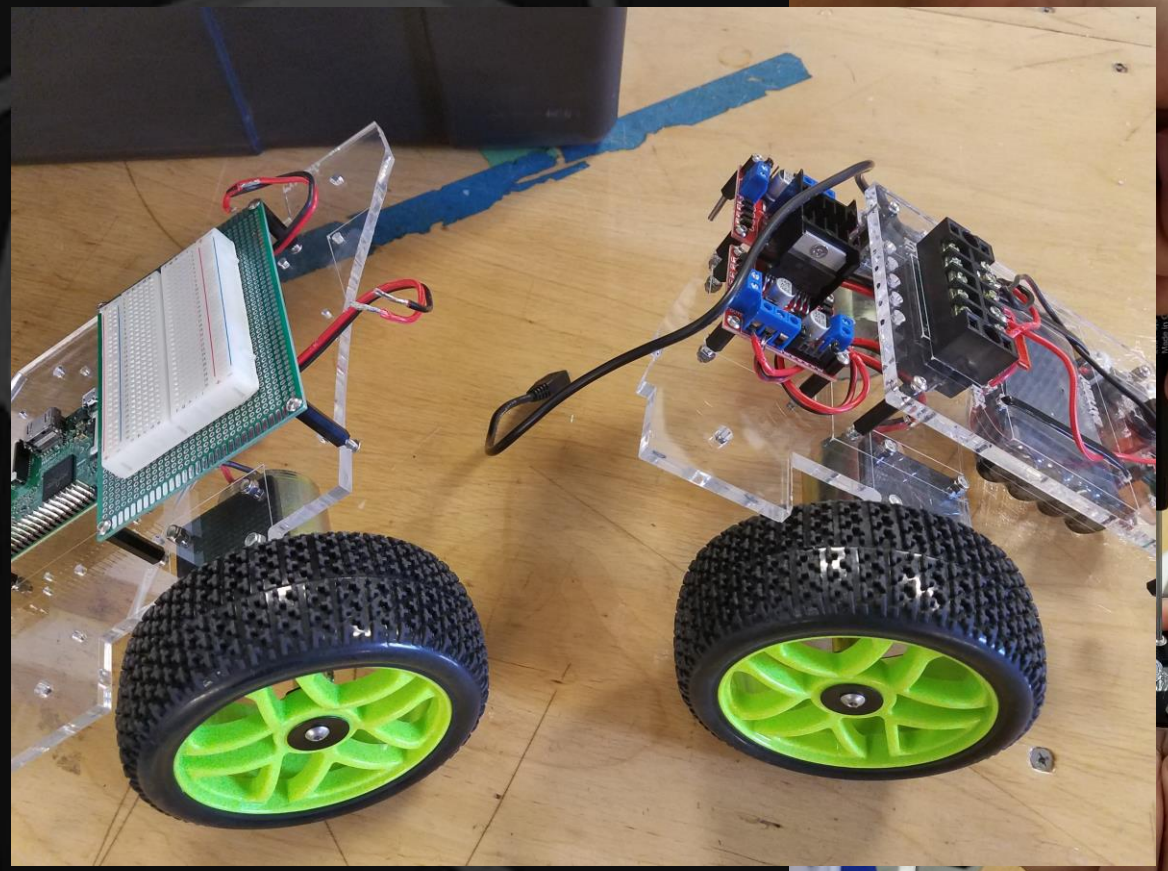
The bumper will be attached directly to the switches, as the acrylic fits snugly into the groove on the switch.

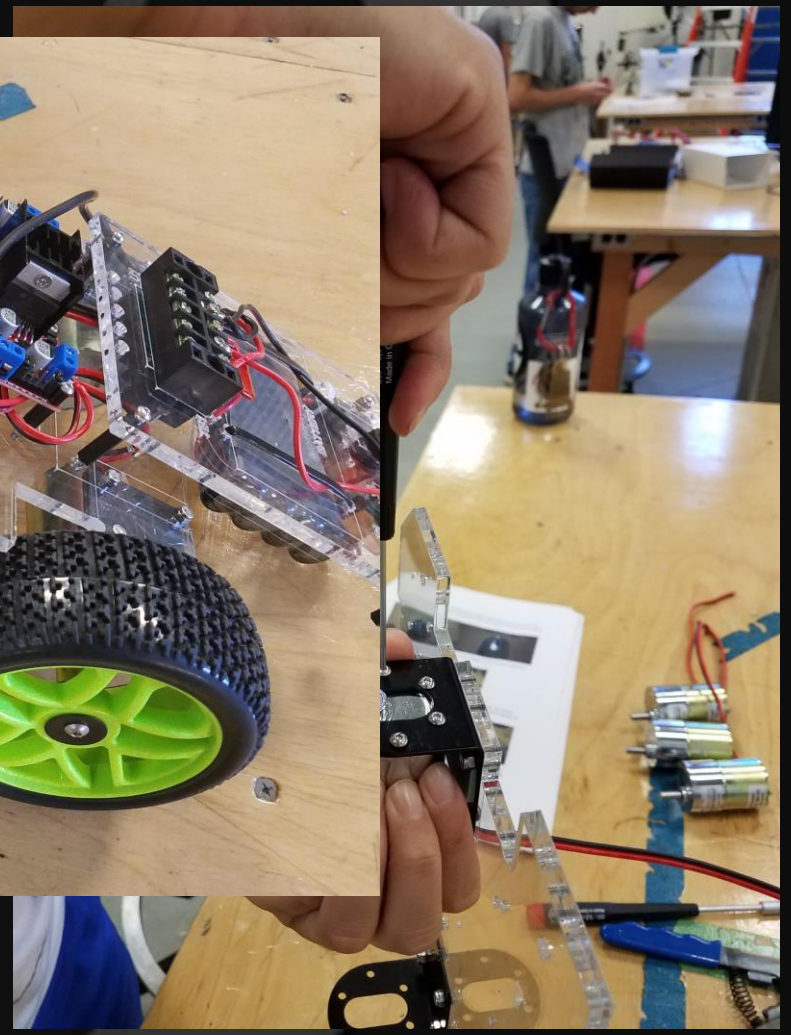
An initial bumper will be made out of cardboard.
The bumper pieces will be designed in CAD, then cut on the laser cutter.

Outcomes/Results

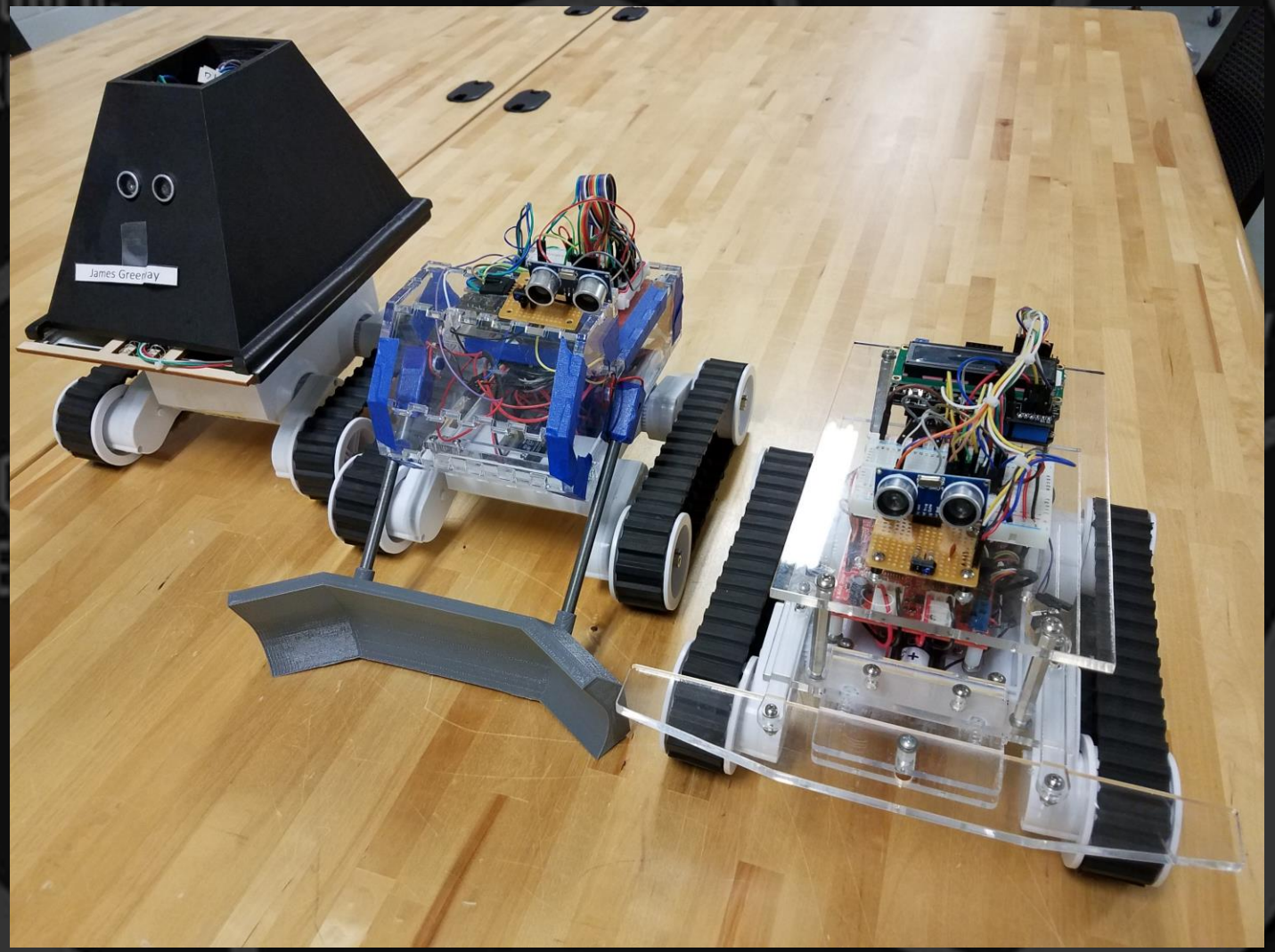
AUTHENTICITY

Rover Design AND Build





STUDENT VOICE AND CHOICE

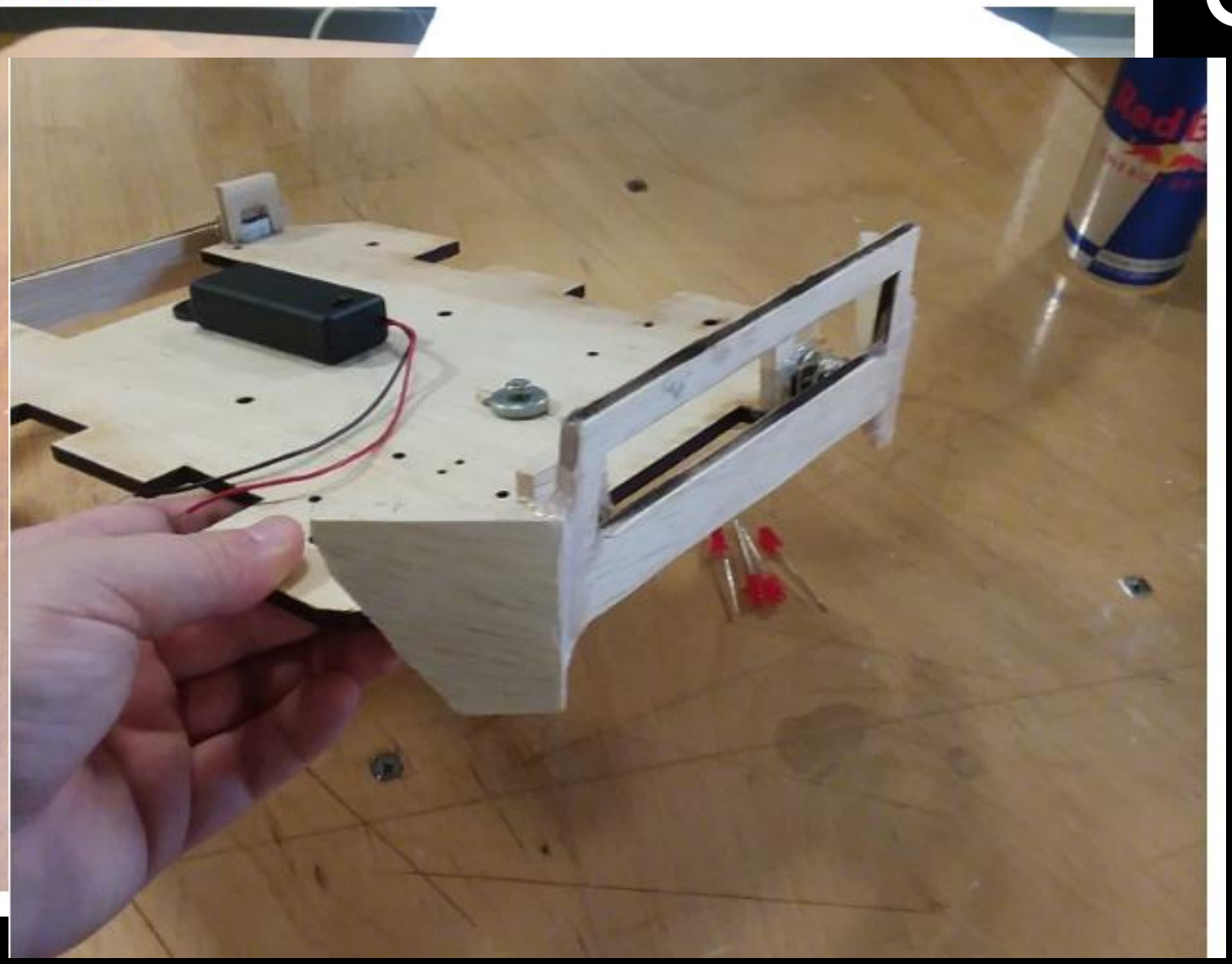


REFLECTION

- What did I accomplish since our last session?
- What do I need to accomplish today?
- What are my obstacles or impediments?

CRITIQUE AND REVISION

Side View:

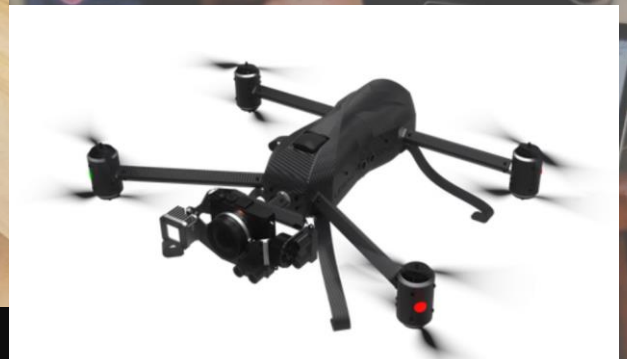


GN REVIEW AND PRESENTATION

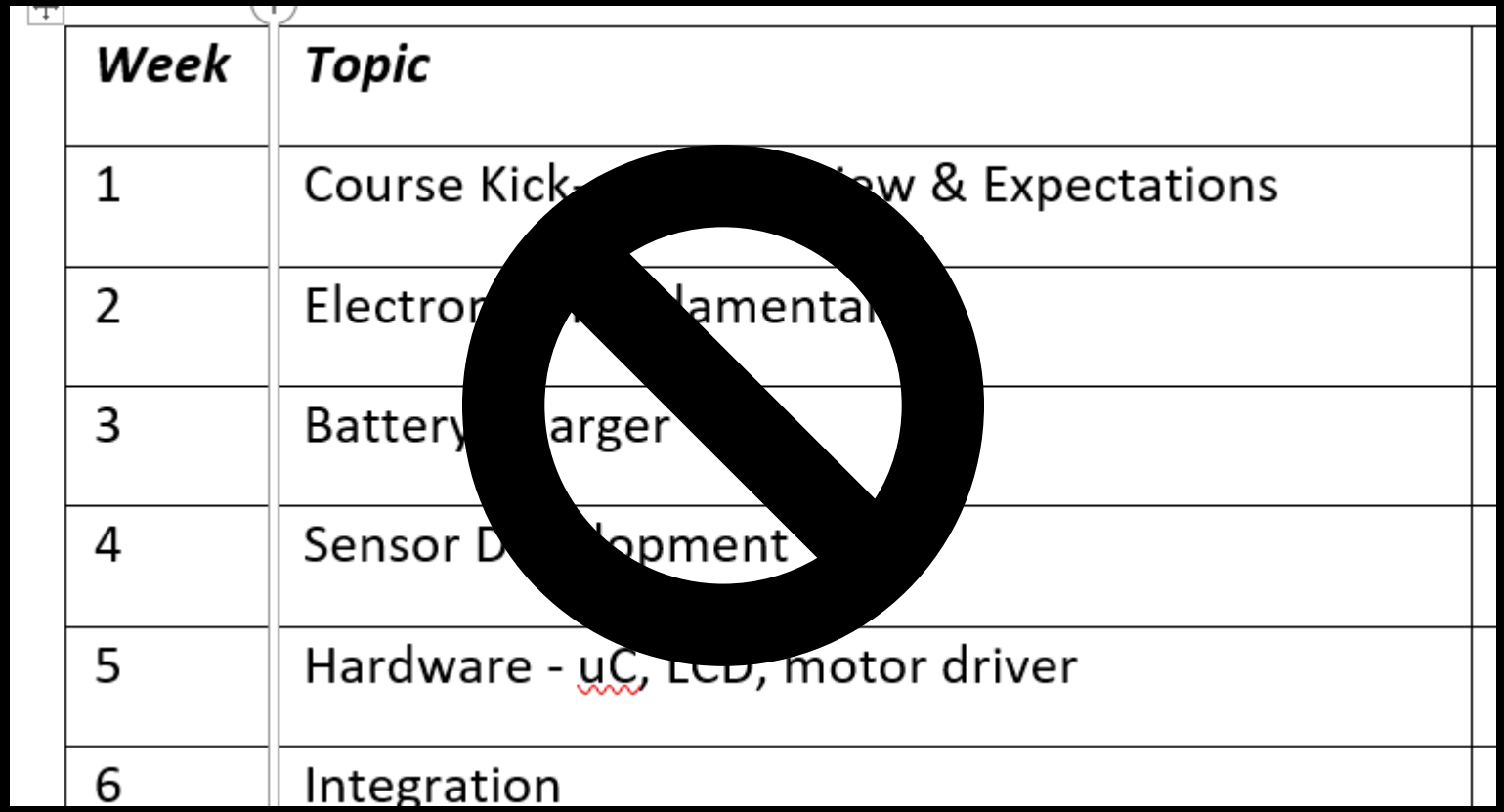
interactive aerial

WHO ARE WE? PRODUCT DEMONSTRATION OUR TEAM NEWS CONTACT US

OUR TEAM

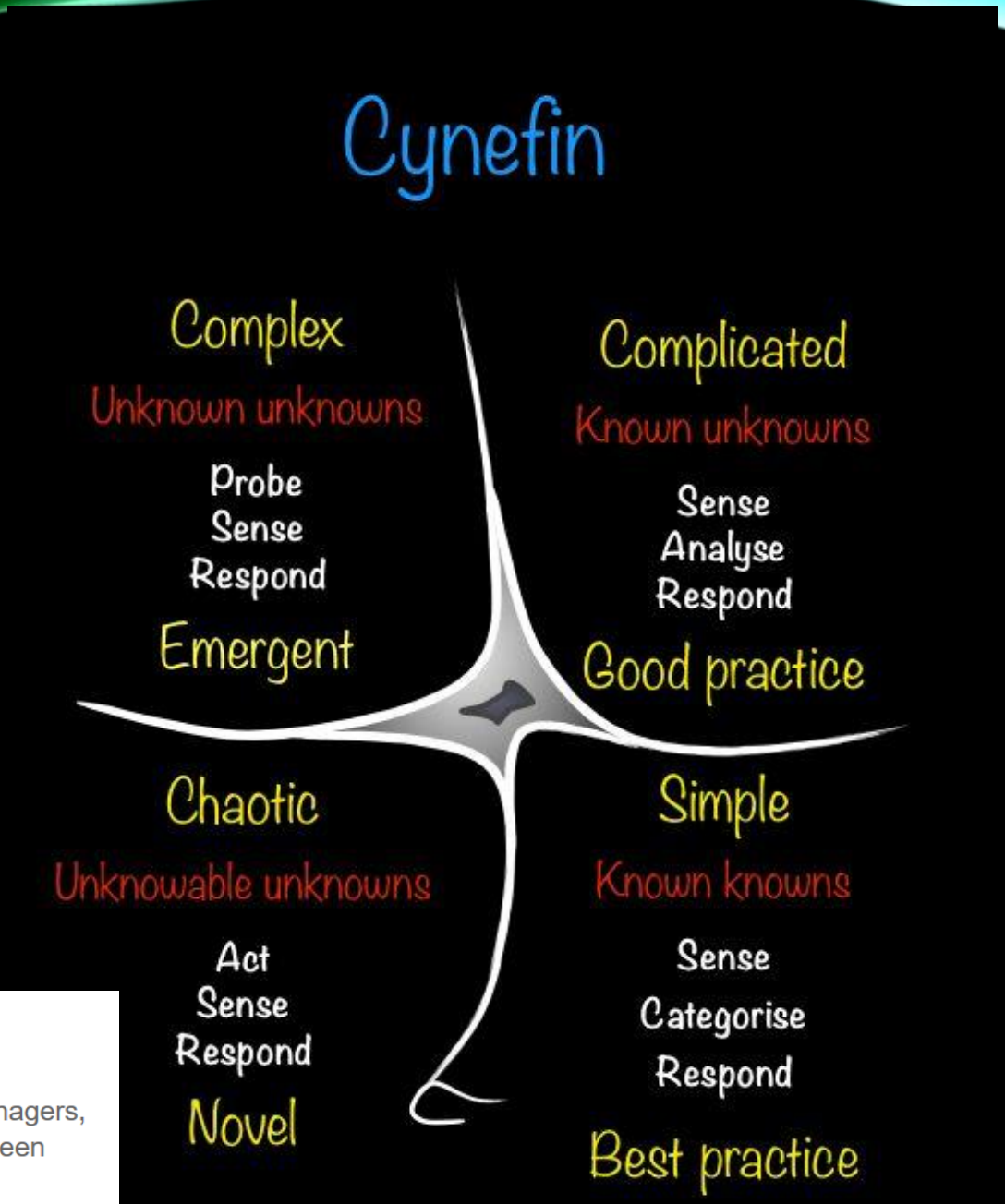


PROJECT-BASED LEARNING CHALLENGES THE INSTRUCTOR



Week	Topic
1	Course Kick- ew & Expectations
2	Electron lamental
3	Battery arger
4	Sensor D opment
5	Hardware - uC, LCD, motor driver
6	Integration

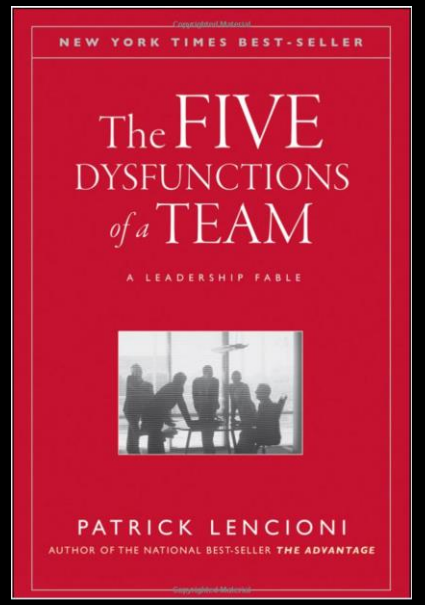
UNCERTAINTY AND EMERGING REQUIREMENTS



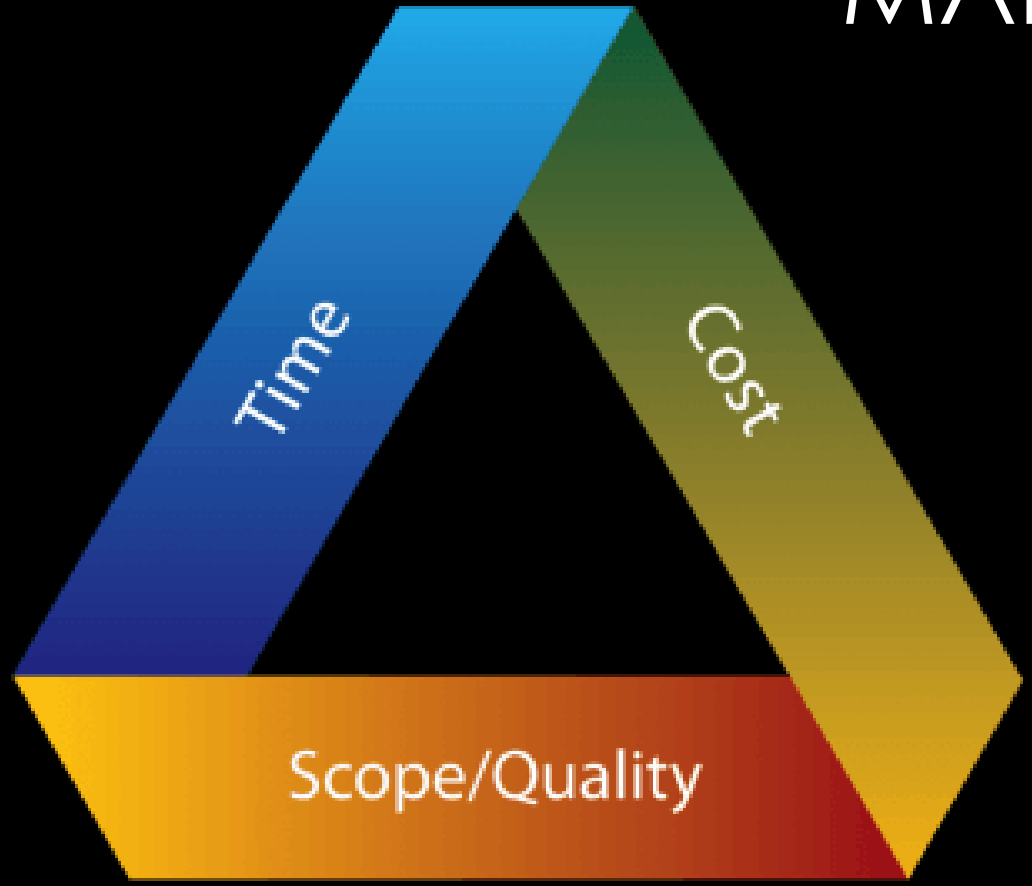
Cynefin framework - Wikipedia
https://en.wikipedia.org/wiki/Cynefin
The **Cynefin framework** (/ˈkʌnɨvɪn/ kun-EV-in) is a conceptual **framework** used to help managers, policy-makers and others reach decisions. Developed in the early 2000s within IBM, it has been described as a "sense-making device". **Cynefin** is a Welsh word for habitat.
Background · Domains · Applications and ...

AGILE TOOLS APPLIED TO PBL

BUILD THE CULTURE



TRIPLE CONSTRAINT OF PROJECT MANAGEMENT



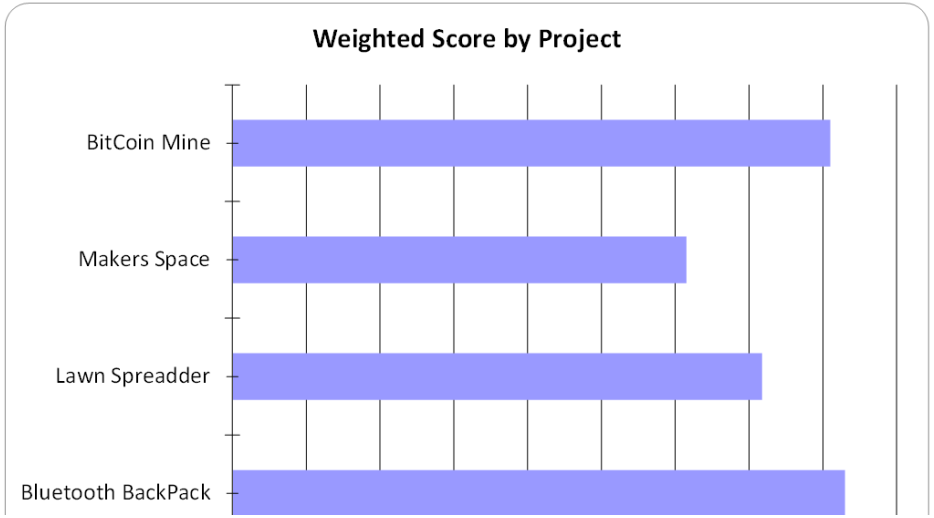
PROJECT SELECTION

Weighted Scoring Model for EET260

Created by: **Date:**

Note: Enter your scores (1-10) for each project in the template below.

Criteria	Weight	BitCoin Mine	Makers Space	Lawn Spreadder	Bluetooth BackPack
Appropriate Scope	40%	10	7.5	8	10
Budget/Cost	10%	10	8	8.5	10
High Value To Stakeholder/product owner	15%	8	5	8	7
Appropriate Skill Set	15%	7	6.5	8.5	10
Limited Transition After Project	5%	10	4.5	5	5
		0	0	0	0
External Dependency	10%	5	5	7	8
Clearly Demonstratable deliverables	5%	7	8	8	10
Weighted Project Scores	**100%**	**8.1**	**6.15**	**7.175**	**8.3**



PITCH THE PROJECT

Lean Canvas

Designed for:

Designed by:

On: Day Month Year

Iteration: No.

Problem	Solution	Unique Value Proposition	Unfair Advantage	Customer Segments
Top 3 problems	Top 3 features	Single, clear, compelling messages that states why you are different and worth buying	Can't be easily copied or bought	Target customers
Existing Alternatives	Key metrics Key activities you measure	High-Level Concept	Channels Path to customers	Early Adopters

Cost Structure	Revenue Streams
Customer acquisition costs, Distribution costs, Hosting, People, etc	Revenue model, Life time value, Revenue, Gross margin

Lean Canvas is adapted from the Business Model Canvas
and is licensed under the Creative Comons Attribution-Share Alike 3.0 Un-ported License

Created by Ash Maurya
Based on the book Running Lean

Lean Canvas

Designed for:

Designed by:

On: Day Month Year

Iteration: No.

Problem
Top 3 problems

Solution
Top 3 features

Unique Value Proposition
Single, clear, compelling messages that states why you are different and worth buying

Unfair Advantage
Can't be easily copied or bought

Customer Segments
Target customers

Key metrics
Key activities you measure

Channels
Path to customers

Existing Alternatives

High-Level Concept

Early Adopters

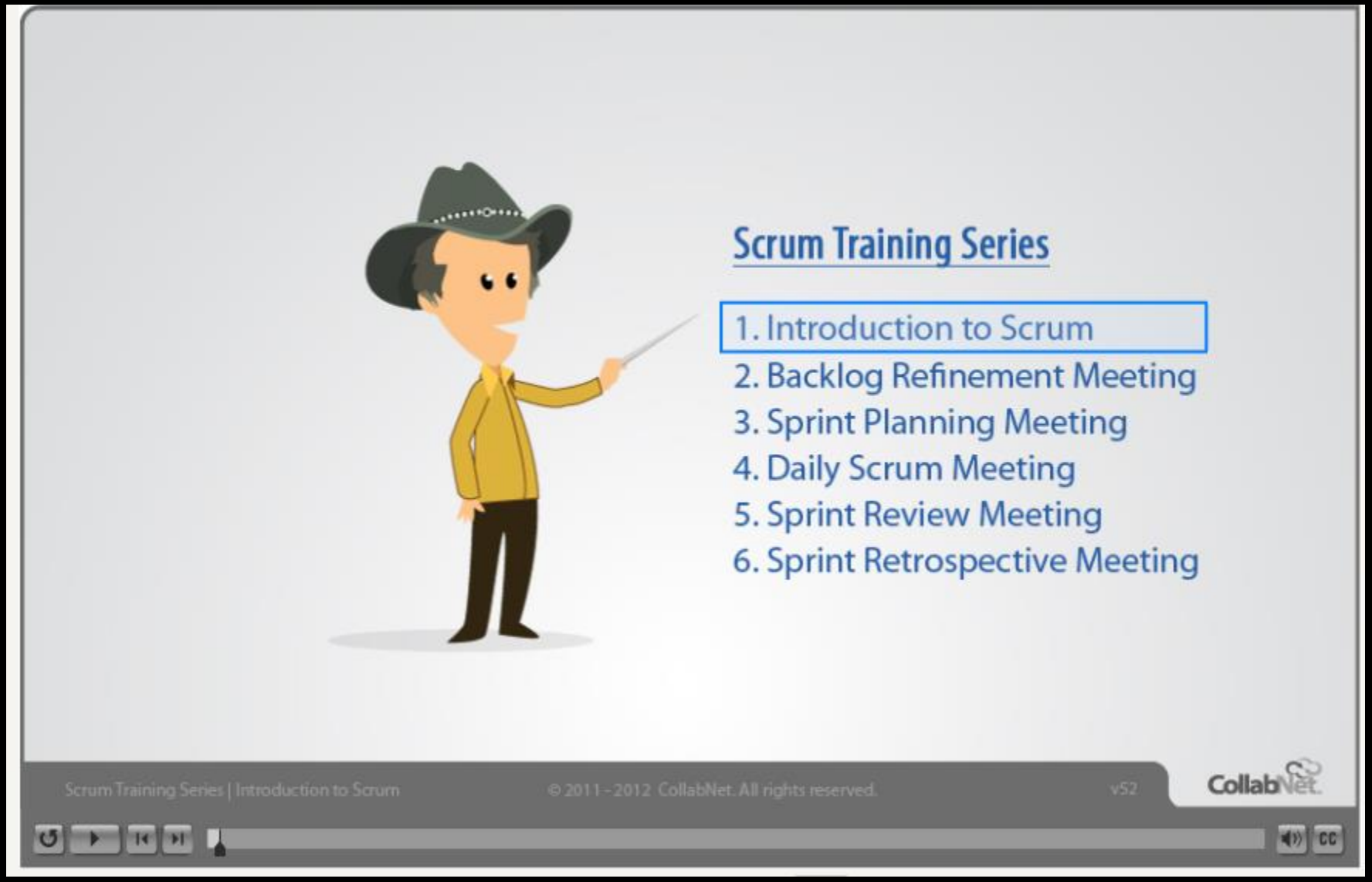
Cost Structure
Customer acquisition costs,
Distribution costs,
Hosting,
People, etc

Revenue Streams
Revenue model,
Life time value,
Revenue,
Gross margin

MANAGE ACTIVITIES

SCRUM

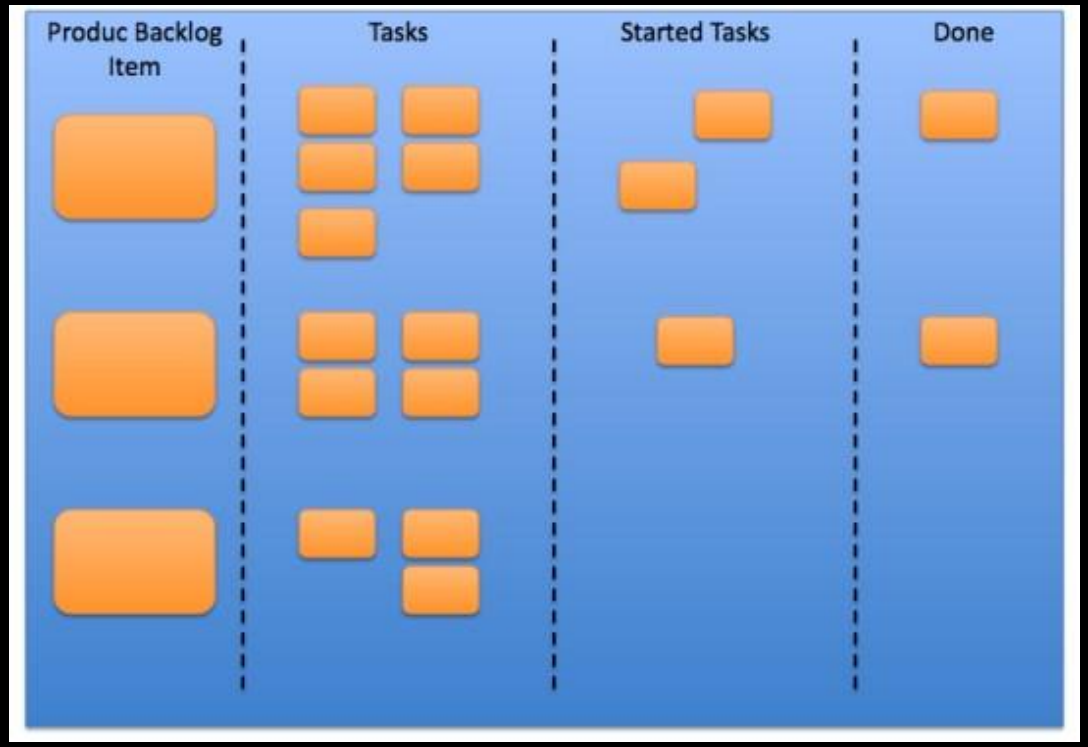
SCRUMTRAININGSERIES.COM



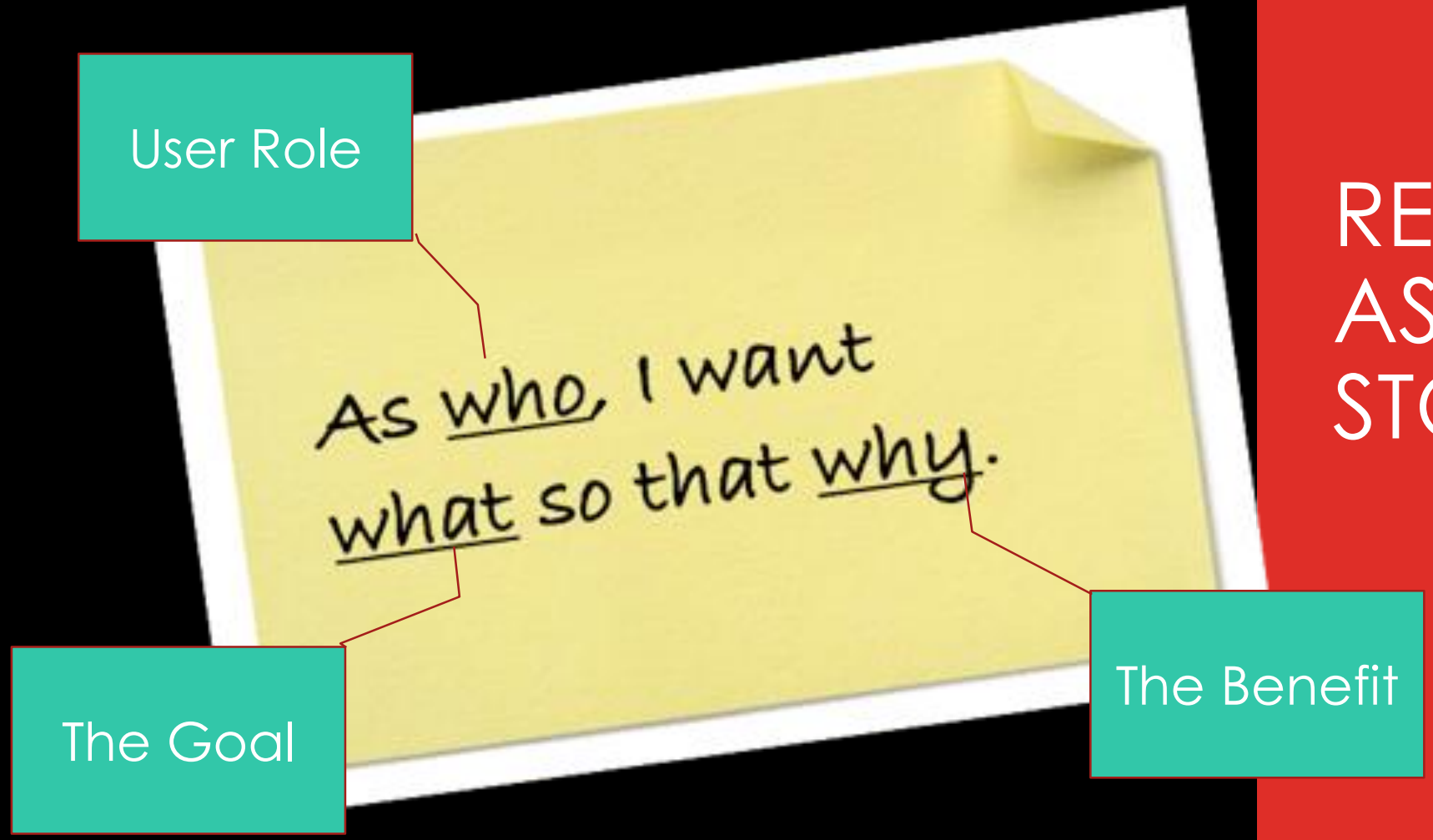
SCRUM ACTIVITIES AND ARTIFACTS

Sprint

- Time boxed
- Specific Start/End
- Backlog Feature Selected
- Tasks Defined
- Tasks Assigned
- Status Tracked

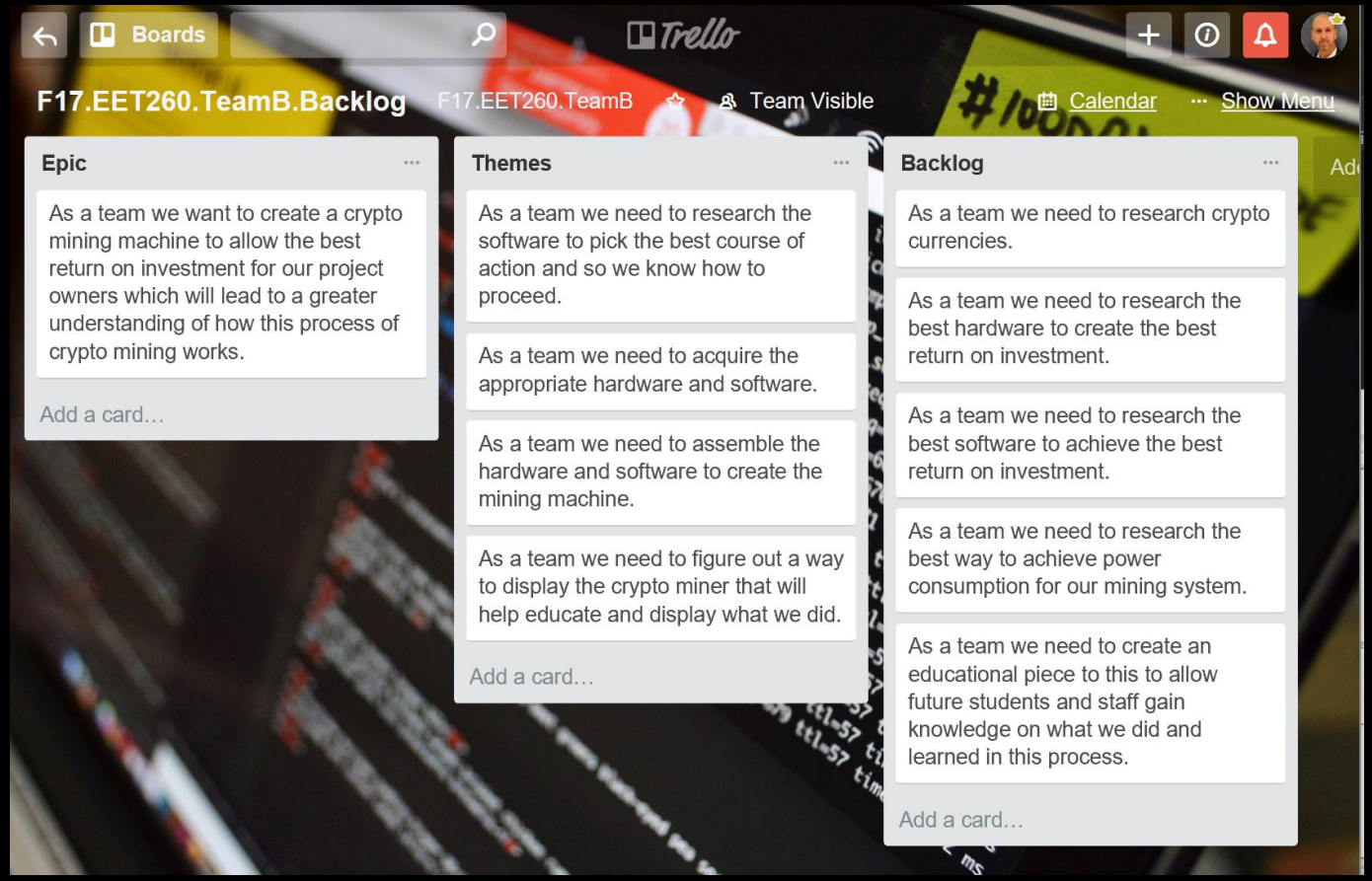


REQUIREMENTS AS USER STORIES

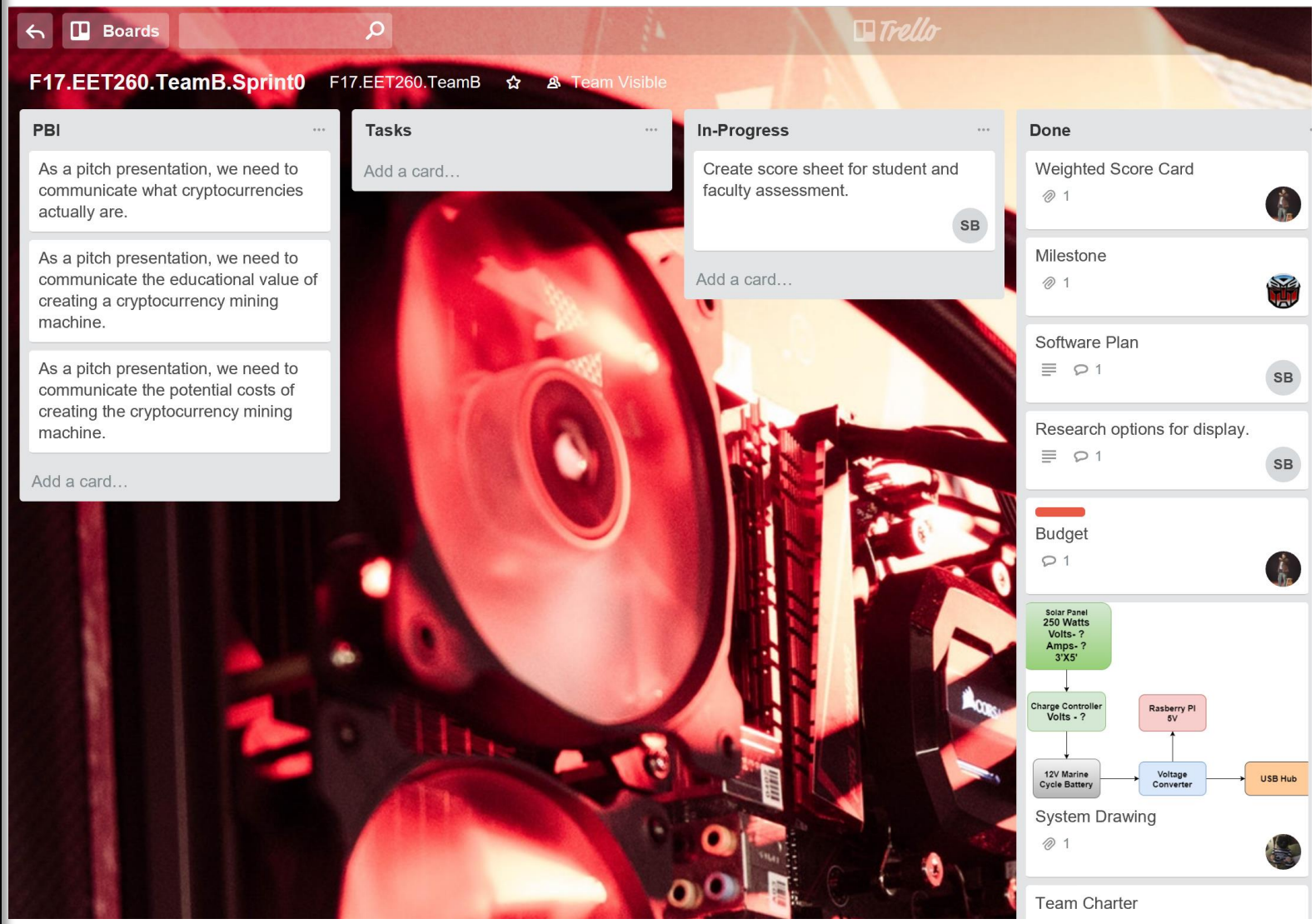


DEFINING SCOPE

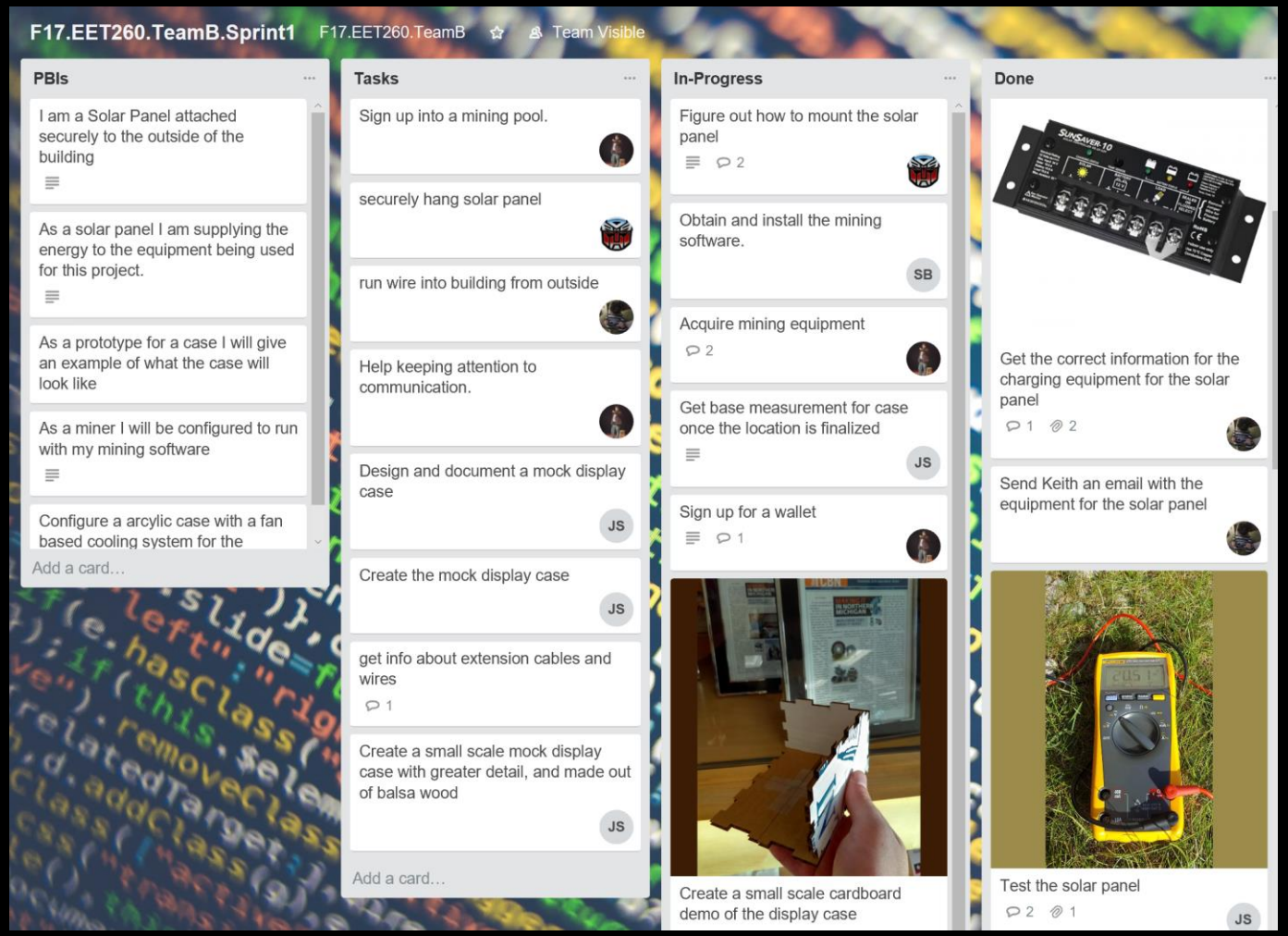
- Creating a Backlog
- Stories!
- Deconstruction
- Trello.com



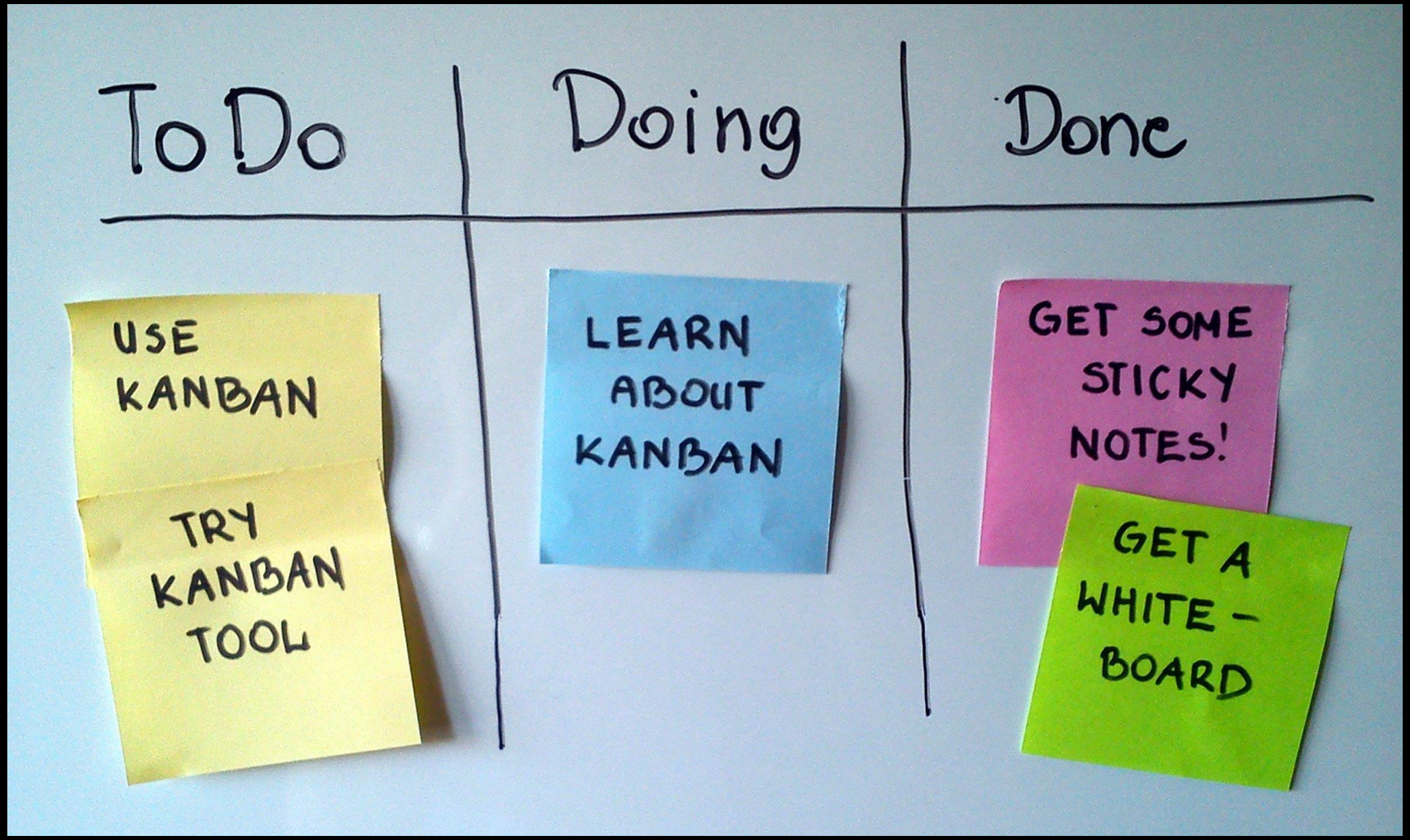
SPRINT 0 – DEFINITION AND PITCH



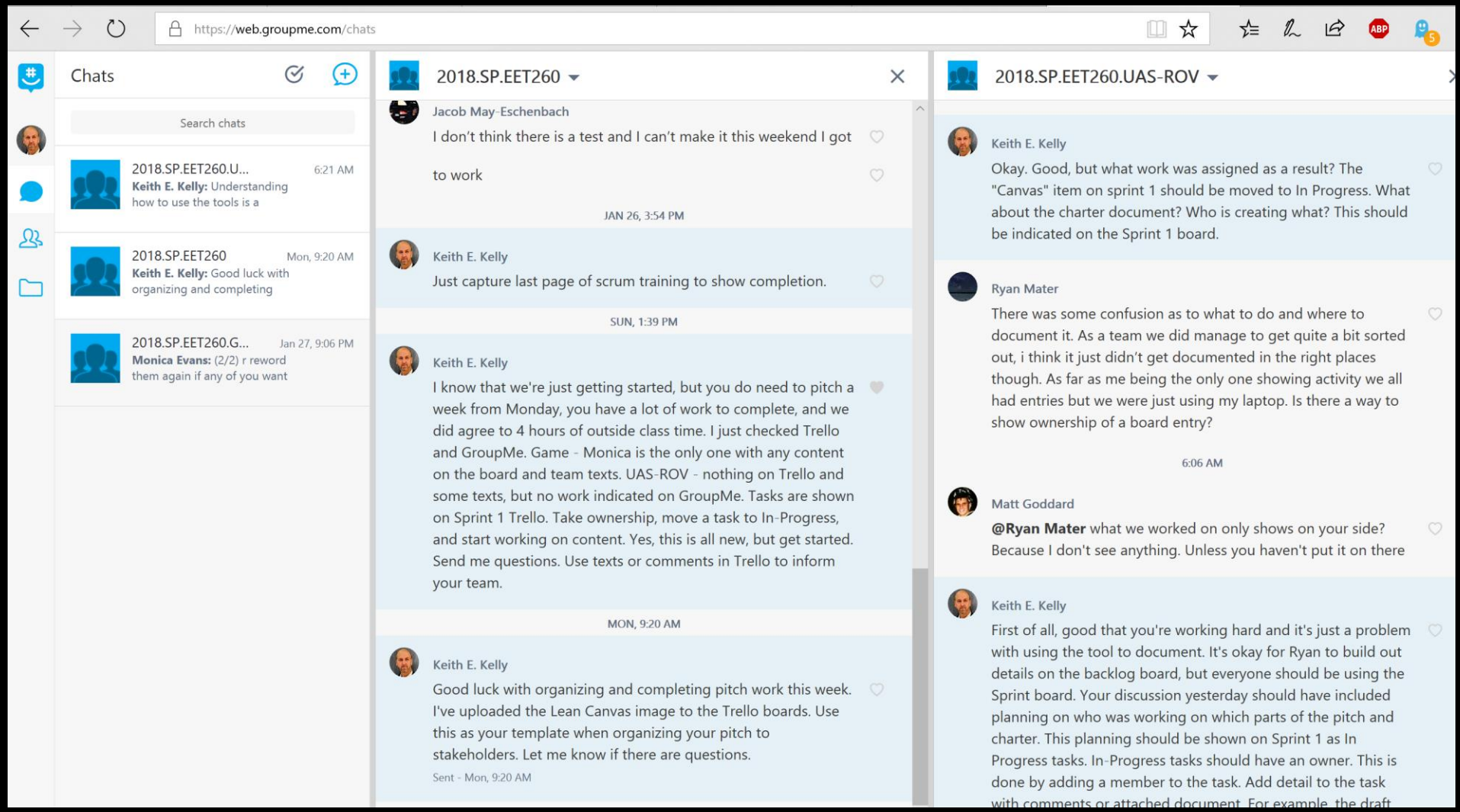
EXECUTION – SPRINTS 1 AND 2



USE POST-ITS!


To Do
Doing
Done
USE KANBAN
TRY KANBAN TOOL
LEARN ABOUT KANBAN
GET SOME STICKY NOTES!
GET A WHITE-BOARD

COMMUNICATION



SPRINT REVIEW

SPRINT RETROSPECTIVE

Plus

- I think a group of strangers clicked really well and actually got some stuff done. It was kind of impressive for how little we knew and interacted with each other lead to something like that
- How well we communicated in our forum and on our board.

Delta

- better communication between members outside of class
- better understanding of roles

Actions

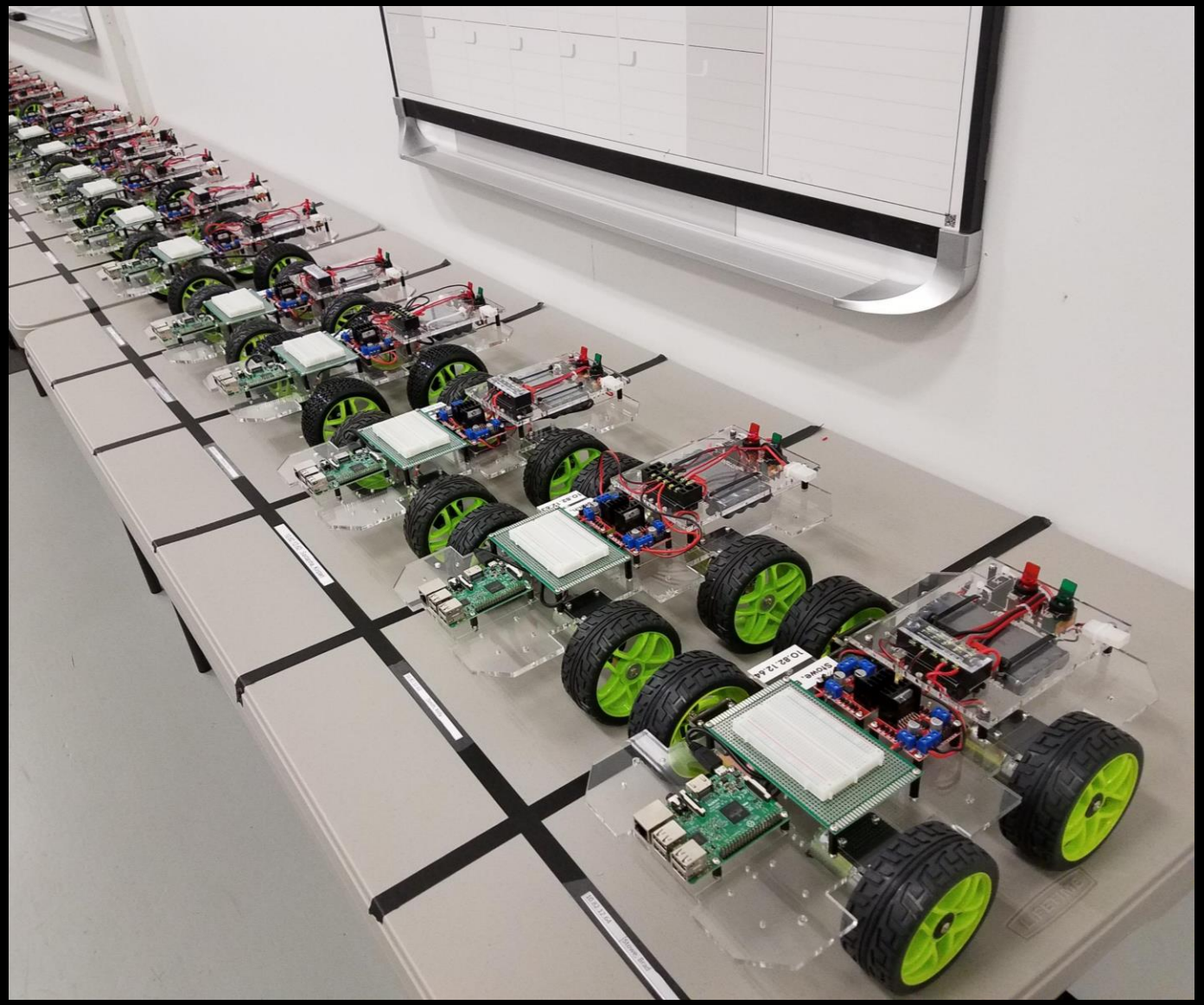
- Try and engage more with the team and getting them motivated

Yes, but I'm not technical. Does PBL and Agile still fit?

Other examples?

LESSONS LEARNED

- PBL works, discovery learning does not
- Learning is rich
- Learning can be messy
- Teams must be functional
- External Product Owners and Stakeholders create authenticity
- Team and individual work is public
- Team reflection must be constant



Q & A