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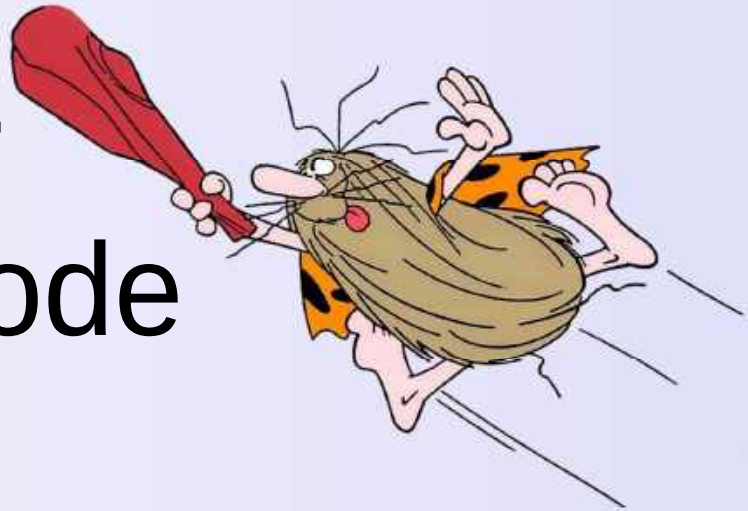
Document your awesome code



- Attila Faragó -

— 20 23 —

EDU ROBOT CAMP


Documenting ...
Understanding ...
Brainstorming ...
Planning ...
Focusing ...
Testing ...
Improving ...
... code is a waste of time

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Documenting ...
Understanding ...
Brainstorming ...
Planning ...
Focusing ...
Testing ...
Improving ...

Documentation helps you with the **process**

Importance of an conscious engineering process helps **focus on "the goal"**

Improvements helps you reach excellent results – "**Fail early fail often**"

Score points on judging*

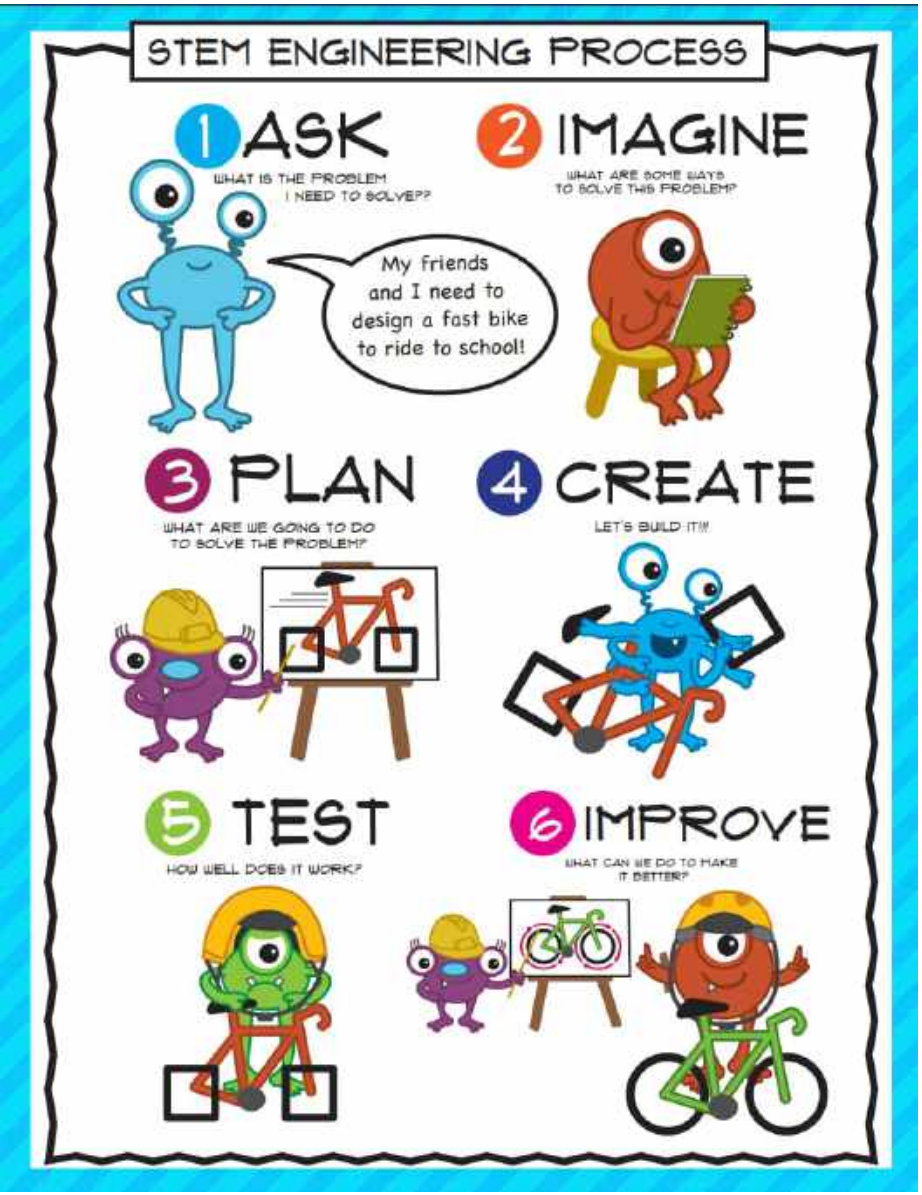
... code is NOT a waste of time

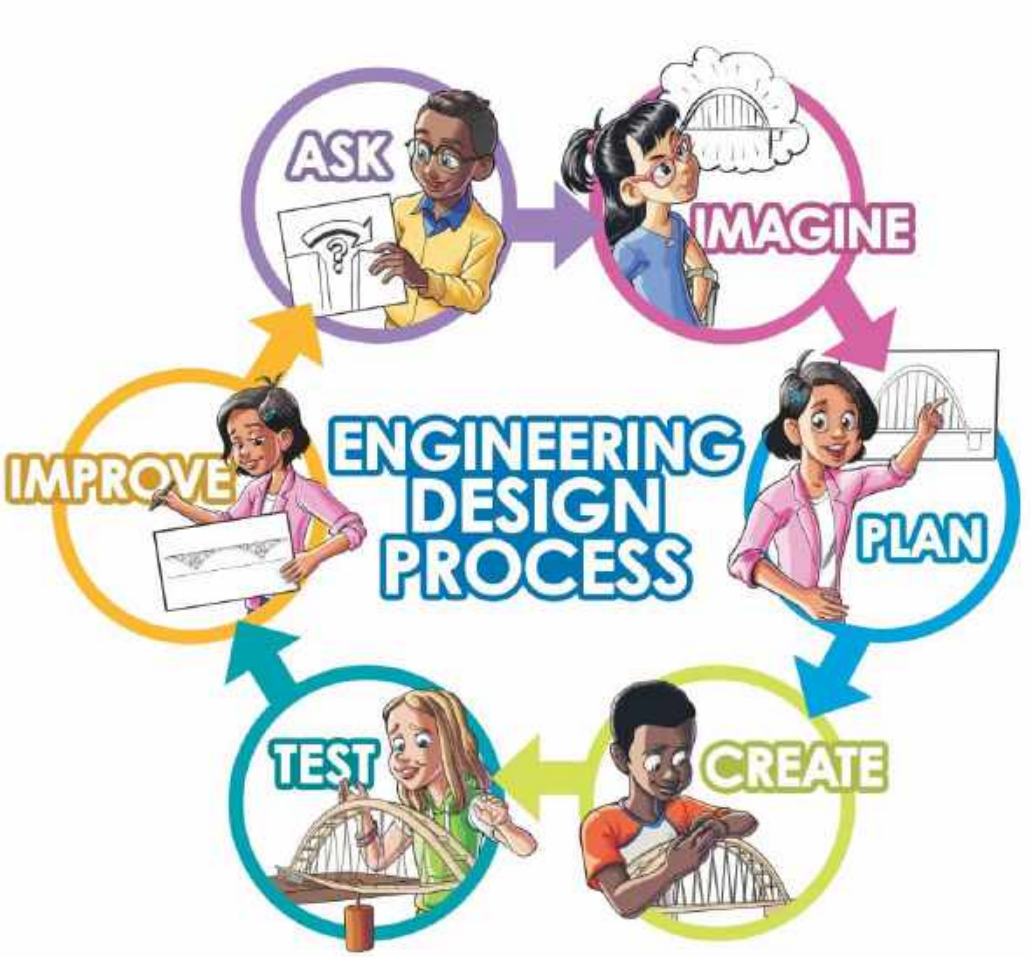
Engineering Process

EDP is a step-by-step guide that engineers use to solve problems. As your teachers implement this process, students will discover scientific solutions and learn core content along the way.

The engineering design process has six stages:

1. Ask — Identify a problem, then ask questions to understand it better.
2. Imagine — Brainstorm ideas on how to solve the problem.
3. Plan — Choose one idea and plan how to create the solution.
4. Create — Acquire any necessary materials and create the solution.
5. Test — See if the solution works by collecting and analyzing data, and evaluating strengthens and weaknesses.
6. Improve — Make adjustments to improve the solution, then test it again.


STEM ENGINEERING PROCESS
1 ASK
WHAT IS THE PROBLEM I NEED TO SOLVE??
2 IMAGINE
WHAT ARE SOME WAYS TO SOLVE THIS PROBLEM?
My friends and I need to design a fast bike to ride to school!
3 PLAN
WHAT ARE WE GOING TO DO TO SOLVE THE PROBLEM?
4 CREATE
LET'S BUILD IT!!!
5 TEST
HOW WELL DOES IT WORK?
6 IMPROVE
WHAT CAN WE DO TO MAKE IT BETTER?


ASK
IMAGINE
PLAN
CREATE
TEST
IMPROVE
ENGINEERING DESIGN PROCESS

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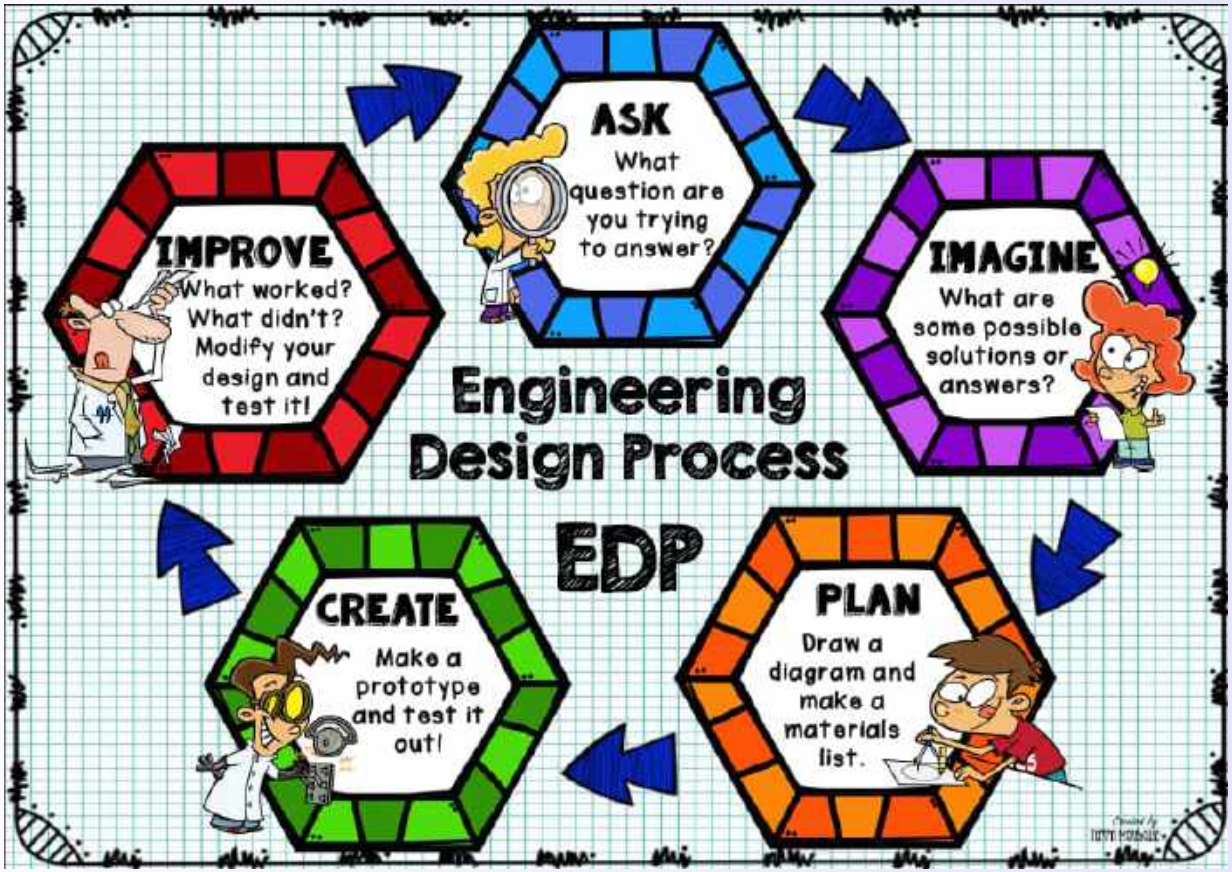
Engineering Process



Robot Design Executive Summary (RDES)

FIRST LEGO League

To help the Robot Design Judges quickly and consistently learn about your robot and the design process used, we are requiring a short presentation. An "executive summary" is often used by engineers to briefly outline the key elements of a product or project. In other words, the purpose of the RDES is to give the Robot Design Judges an outline of your robot and all that it can do. The RDES is intend your team consider in advance the most important information to share with the Judges. What you c share will enable the Judges to effectively evaluate your team and provide more helpful feedback.

Your team is free to determine how much time you invest, but realistically it should only take a few hou develop and practice the RDES. The RDES is NOT intended to be as extensive or time consuming as your Project.

Your team will present your RDES at the beginning of your Robot Design judging session. The entire presentation, including the trial run, should not take any longer than **four (4) minutes**. Following your Robot Design presentation the Judges will pose questions for your team to answer. You are not required to provide a written version of the RDES to leave with the Judges.

Basic Outline: The RDES should include the following elements: *Robot Facts*, *Design Details*, and a short *Trial Run*.

Robot Facts: Share with the Judges a little bit about your robot, such as the number and type of sensors, drivetrain details, number of parts, and the number of attachments. The Judges would also like to know what programming language you used, the number of programs and the amount of memory used by each program, and your most consistently completed mission.

Design Details:

1. Fun: Describe the most fun or interesting part of robot design as well as the most challenging parts. If your robot has a name, who chose the name and why. If your team has a fun story about your robot please feel free to share.
2. Strategy: Explain your team's strategy and reasoning for choosing and accomplishing missions. Talk a little bit about how successful your robot was in completing the missions that you chose. Judges may like to hear about your favorite mission and why it is your favorite.
3. Design Process: Describe how your team designed your robot and what process you used to make improvements to your design over time. Briefly share how different team members contributed to the design and how you incorporated all the ideas.
4. Mechanical Design: Explain to the Judges your robot's basic structure, how you make sure your robot is durable and how you made it easy to repair or add/remove attachments. Explain to the Judges how the robot moves (drivetrain), and what attachments and mechanisms it uses to operate or complete missions.
5. Programming: Describe how you programmed your robot to ensure consistent results. Explain how you organized and documented your programs, as well as, mention if your programs use sensors to know (and ensure) the location of the robot on the field.
6. Innovation: Describe any features of your robot design that you feel are special, different or especially clever.

Trial Run: Demonstrate the operation of your robot for the Judges performing the mission(s) of your choice. Please do not do an entire robot round; time will be needed for Judges to ask questions of your team.

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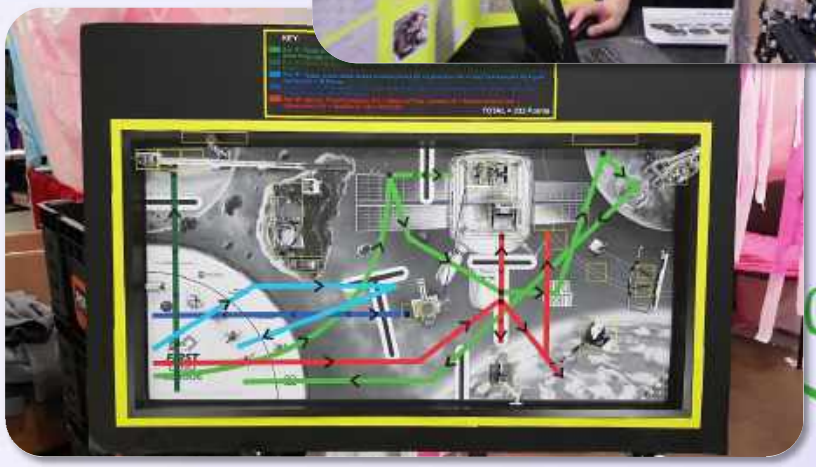


https://fll.gatech.edu/sites/default/files/images/robot_design_executive_summary.pdf

Robot Design

Ahead of Tournament Day...

- Before the robot can solve the Robot Game missions, you have to build and program it.
- Collect ideas for the construction of the robot and create several concepts for the robot's base and attachments.
- Plan and build several prototypes to try out different ideas and then implement the best ideas for the actual robot.

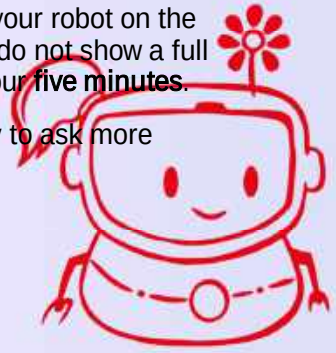
How to excel...

The robot that is chosen for the award "Robot Design", impresses the jury with an innovative and robust design as well as with creative and efficient programming.

- **Innovative design**: The ability to create a creative design or innovative strategy. Because the tasks should be mastered in the most original way possible.
- **Robust design**: Correct mechanical principles should be understood and applied. For this purpose the most solid, reliable and persistent robot must be built.
- **Programming**: Correct programming principles should be understood and applied. The children and young people should develop a lot of creativity and efficiency in programming.

On Tournament Day...

- You will present your Research, Robot Design and Core Values in one combined judging session to the judges. This session lasts 35 minutes and takes place in a judging room.
- Prepare an **oral report** about the construction, programming and strategy of your robot. This report must not be longer than **five minutes**! The jury will stop longer explanations, so that all teams have the same chance.
- It is **exciting for the judges** to learn about the construction process or to find out what you are most proud of in the robot and if there are parts that need improvement. The use and selection of sensors is another interesting aspect.
- You can show the judges a video of a trial run of your robot on the Robot-Game field. Choose specific missions and do not show a full match. The trial run needs to take place within your **five minutes**.
- After your report, the judges have the opportunity to ask more questions about your robot.



FIRST LEGO League

What makes a good robot

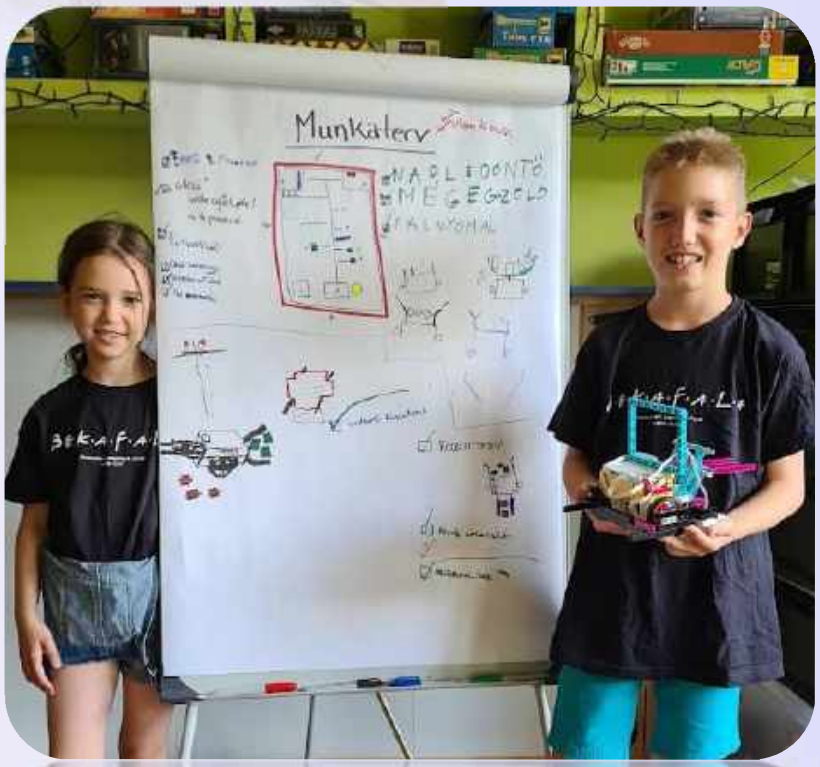
1. Consistency
2. Consistency
3. Consistency
4. If your robot cannot perform a task 10 times in a row without failing, it will probably not work properly in competition!
5. Keep it simple (KISS)

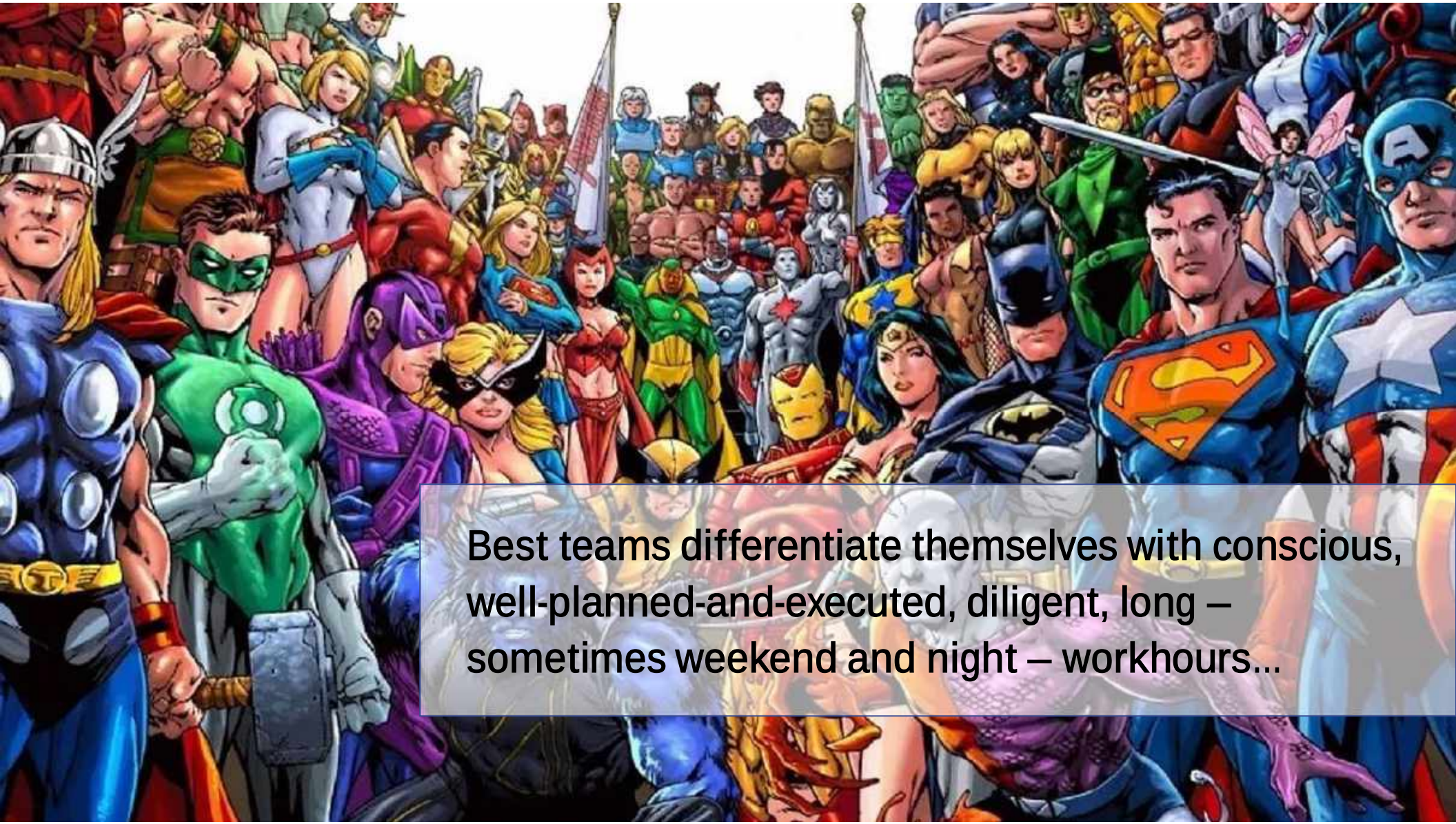
https://www.highlandersfrc.com

Best practices

1. Ahead planning
2. Engineering journal
3. Practice presenting to each other & outsiders even in not judged
4. Learn about how others do it – learn and do not copy
5. Keep things simple!
6. Its ok for team members to fail
7. Teach debug/troubleshooting techniques than solving problems for them
8. Know your abilities and what to take on with what you have
9. Set a schedule and stick to it
10. Read the rules - multiple times
11. Practice, Practice, Practice! (well enough in advance)

https://www.highlandersfrc.com




Best teams differentiate themselves with conscious, well-planned-and-executed, diligent, long – sometimes weekend and night – workhours...

EduCamp: Activity

- Needed material: papers
- Create and EDR cycle
- Task: Fold a paper plane using EDR, with 2 cycles
- 1. ask questions on specification (group facilitator can come up with 1 additional requirement – e.g. draw a robot on it / have some red on it / make a flap on the wing) – 2 mins
- 2. brainstorm – 2 mins
- 3. decide/select best idea – 2 mins
- 4. create the plane – 2 mins
- 5. test how far it can fly – 2 mins
- 6 discuss and decide one improvement for the next iteration – 2mins
- Repeat 3 cycles (or 2 as time allows)
- == who can fly further wins!