

FIRST® **LEGO**® **League**

TUT**RIALS**

teach

share

learn

DEVELOPING AN INNOVATIVE SOLUTION

BY TEAM 3659 NEXT GEN & TEAM PHOENIX

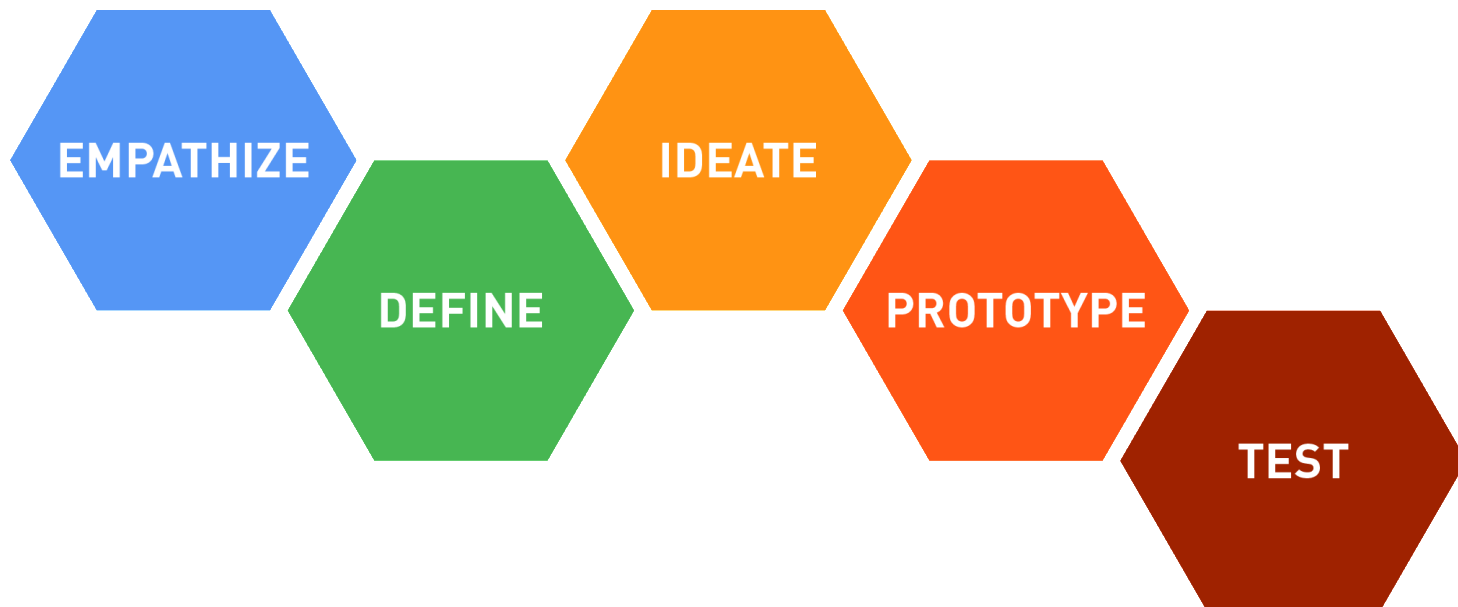
ABOUT THE AUTHORS

- Team Phoenix, an FLL team based in Lafayette, Louisiana.
 - They have attended several International competitions, and placed runner-up at the Global Innovation Award 2017, in Washington D.C.
 - They also love inventing, having fun, and reaching out to our community.
 - You can learn more at <https://www.fish3d.biz/>
- NeXT GEN is a 13th year middle school team from Garrett County, Maryland
 - We won first place 2013 Global Innovation Award (GIA) for the Gramma Jamma
 - We were on one of top 20 GIA Semi-Finalist in 2017 for innovative solution, BeeHaven
 - Most recently, we also won first place Innovative Solution at Mountain State Invitational in 2017



FIRST STEPS

- So, you've found your topic, and now everyone's saying "Now what?" Well, this is where you apply design thinking to the situation.
- Design thinking a process for creative problem solving. We follow the process developed at the [Stanford d.School](#).

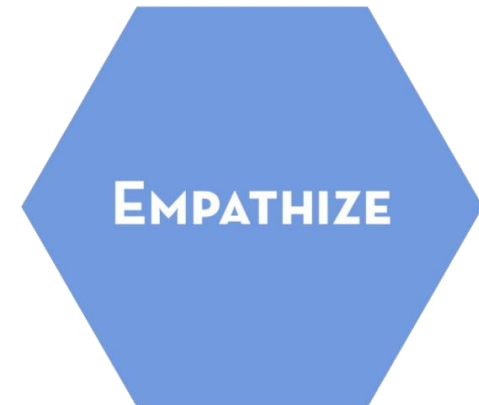


EMPATHIZE

To create meaningful innovations, you need to know your users and care about their lives.

How to Empathize

- Learn all you can about your user
- Watch users in their lives
- Talk to them

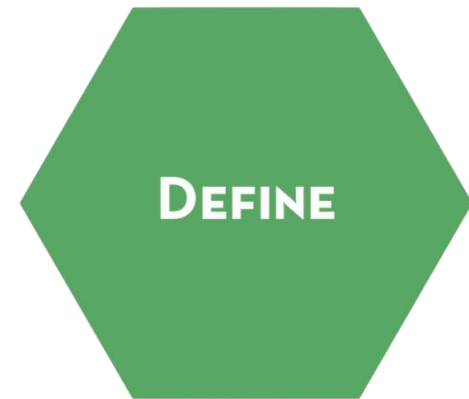


DEFINE

Framing the right problem is the only way to create the right solution.

How to Define

- Based on empathizing, what stood out for you?
- Write clear statement of the problem you will try to solve.



IDEATE

It's not about coming up with the 'right' idea, it's about generating the broadest range of possibilities.

How to Ideate

- Go for quantity of ideas
- Do not reject any ideas

Helpful Videos

- [How not to brainstorm!](#)
- [Brainstorming Rules](#)



PROTOTYPE

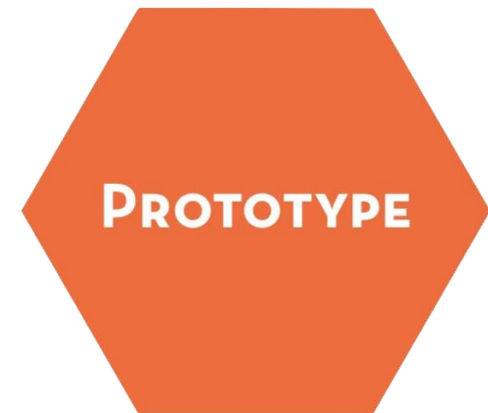
Build to think and test to learn

How to Prototype

- Start building right away
- Build with simple materials like cardboard

Helpful Video

- [How to make a cardboard prototype](#)

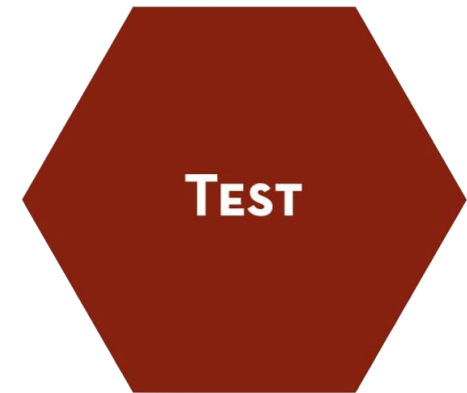


TEST

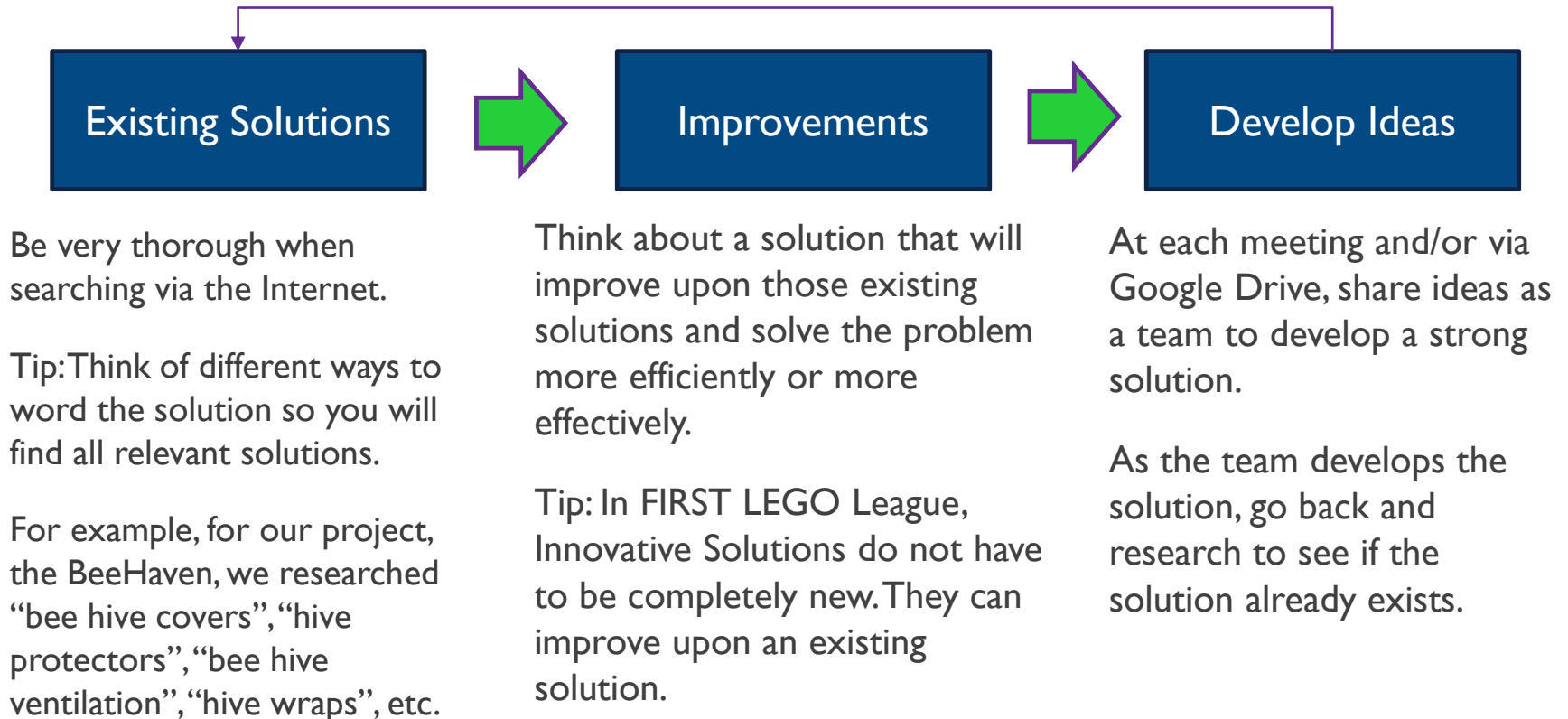
Testing is an opportunity to learn about your solution and your user.

How to Test

- Have people try out your prototype



THE PROCESS



WHAT IS THE INNOVATION?

If your particular solution/improvement does not already exist, you are ready for the next step.



Innovation

List at least three things that make the solution innovative.

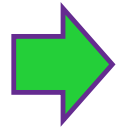
In other words, what makes the team's solution *their* solution? What makes the solution better than the other existing solutions?

Example: Your innovation might be cheaper, easier to make, offer more features than an existing solution.



MODEL, SHARE, TEST

Model



Share/Test

Prototypes are not required in FIRST LEGO League. However, a model of some kind can be helpful. Some teams make models out of LEGO/Cardboard. Some teams provide a drawing. Depending upon the project, some teams are able to develop working prototypes.

If you have a solution that can be tested, it would be a good idea to do so.

If you cannot test the solution, consider sharing your solution with an expert who can tell you if the solution would work.

Example: It would be very difficult for us to test our Nature's Fury project in an airplane flying through a volcano. Instead, we asked professionals in the airline and sensor industries to evaluate our idea.



MODELS AND PROTOTYPES CAN HELP IMPROVE YOUR SOLUTION

- Make a prototype of the solution if possible. It doesn't need to be full scale.
- Present the solution and the prototype to experts and receive feedback about what to improve.
- Discuss as a team the feedback the experts gave. Research their suggestions.
- Discuss how to implement their feedback and why implementing their feedback makes the solution better.
- Implement the expert's feedback by creating a new prototype. Go back and share your new version if possible.



TESTING YOUR INNOVATIVE SOLUTION

- If you are able to make a working prototype, it is a good idea to test your innovative solution
- If the team notices that the solution isn't working, discuss why it's not working. Discuss what can be improved to make the solution work.
- Make the improvements to the prototype and document the changes.
- Test the solution again. If it works, discuss why it works.



Example: We logged our testing data on a website that records live data from sensors placed in various locations within a beehive. You can look at our testing data at <http://Welserver.com/WELI003>

CREDITS

- This lesson was written by Team 3659 NeXT GEN and Team Phoenix, with edits and additional content by the Seshan Brothers.
- You can contact the teams through their Facebook pages:
NeXT GEN : <https://www.facebook.com/NeXTGEN3659>
Team Phoenix: <https://www.facebook.com/PhoenixFLL/>
- More lessons available at www.ev3lessons.com and www.flltutorials.com



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