



Flint Regional Science & Engineering Fair

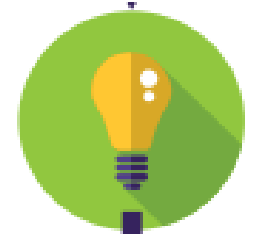
Inspiration, Invention, Innovation

TOPIC 5: BRAINSTORMING SOLUTIONS



BRAINSTORM – We will...

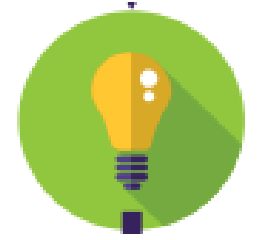
Brainstorm,
Evaluate, and
Choose Solution



- **Brainstorm solutions**
 - Come up with MANY possible solutions to your problem
- **Evaluate and Choose**
 - Consider all the pros and cons of your various solutions
 - Pick the best solution
- **At the end of this step, you will be able to:**
 - Choose your project!

When Presented with a Problem, we have choices...

Brainstorm,
Evaluate, and
Choose Solution



1. Do nothing. (Not a choice in this class!)
No Risk – No Reward
2. **Do the conventional thing – easy solution**
Low Risk – Low Reward
3. **Do something unusual but not creative (such as applying someone else's creative idea in a different way).**
Average Risk – Average Reward
4. **Do something unconventional and creative.**
High Risk – High Reward
5. Do something totally bonkers and completely irrational.
(Not desirable as it implies insanity, but it is an option.)
Insane amount of Risk – Potential Huge Reward (*but extremely unlikely*)

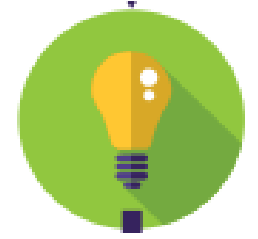
There Are No Rules Here
– We're Trying To
Accomplish Something.

– THOMAS EDISON –



BRAINSTORM

Brainstorm,
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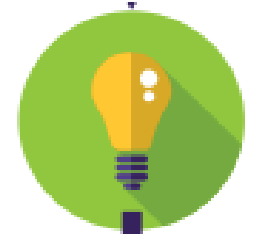


1. Capture ALL Ideas – go *WAY* beyond the obvious
 - wild
 - crazy
 - impractical
 - common
 - reasonable
 - mundane
2. Discuss, without judging, ideas:
 - Build on the ideas of others
 - Combine idea
 - Tweak the ideas of others
 - Critique and defend ideas (be respectful)
3. Record ALL ideas as they come to mind!!!!

DON'T JUDGE YOUR IDEAS OR OTHERS!
(yet)

BRAINSTORM – Step 1: Mull

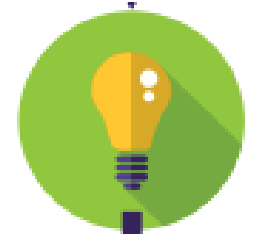
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- Mulling is mentally playing with the problem
- Look at the problem from multiple perspectives – yours, someone from a different country or culture, an adult, someone handicap, an animal...
- In particular, look at the problem from the *perspective of the people affected*
- Feel the problem/situation (feel empathy)

BRAINSTORM – Step 2: Question

Brainstorm,
Evaluate, and
Choose Solution



Ask questions – both the expected (usual) and unexpected (unusual)

Usual

- Who is affected?
- What are the consequences of doing nothing?
- Why not use the conventional solution?
- How would we like the situation to be in a year's time? In five years?
- The five why's – ask why 5 times (get to the root of the problem)

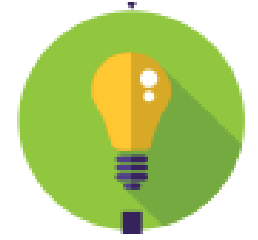
Unusual

Here we think about feelings

- How do we feel about the situation? Why?
- How do those affected by it feel? Why?
- How would we like those affected to feel?
- How do other who are not affected feel?

BRAINSTORM – Step 2: Question, cont.

Brainstorm,
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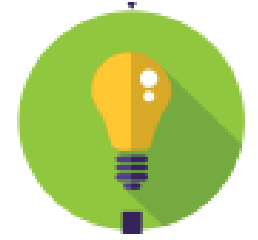


Ask questions – both the expected (usual), unexpected (unusual) and the *really odd* questions?

- What does the situation sound like?
- What would Google do in this situation?
- What would happen if we let a penguin wander around the situation?
- How would a __tree, bird, squirrel, dolphin, dog...__ solve this problem?
- What would ChatGPT say about this?
- *How is this problem solved in nature?* (This questions shouldn't be odd, but we often forget to ask this question.)

BRAINSTORM – Step 3: Incubate

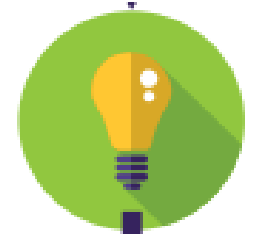
Brainstorm,
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- Take a step away for a day or two (a week or more if you are not on a time schedule).
- Going for walks or relaxing and allowing your mind to wander.
- Do not dismiss any ideas as to obvious or crazy!!
- Write down the ideas as they come to mind!!! (Often, this is right when you wake in the morning.)
- This step works best AFTER you have done steps 1 & 2.

BRAINSTORM – Other Ways To Get Ideas

Brainstorm,
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Assumption Breaking: Challenge assumptions (can something work a different way?)

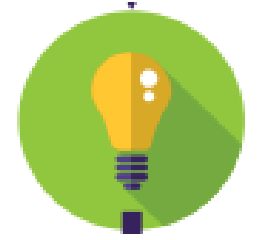
Breakdown: Take the problem apart into small components; if the problem is a machine, take it apart to see how it works

Rapid ideation: Write or say as many possibilities as possible in a short amount of time

Role play: Become the other person and let them solve the problem

BRAINSTORM – Other Ways To Get Ideas

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Reversal: Look at the problem backwards

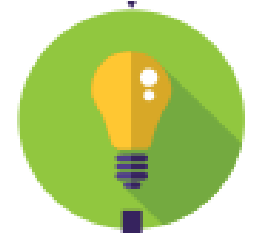
Visioning: See the future with the problem solved

Wishing: State ideas as wishes

Write streaming – Write and write until you unblock

GROUP BRAINSTORMING – Rules

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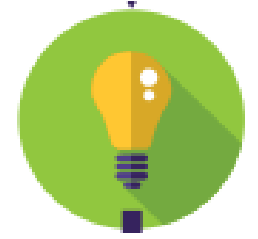
- **Imagine: Develop Possible Solutions**

- **All** ideas are presented and recorded for later use
- No judgements!
- Build on the ideas of others
- Look to nature

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

GROUP BRAINSTORMING – Critique and Discuss idea

Brainstorm,
Evaluate, and
Choose Solution



- Group like solutions.
- Any patterns in the solution?
- Can any ideas be combined?
- Discuss each possible solution
(using thinking hats – next slide).

BRAINSTORM – Thinking Hats!

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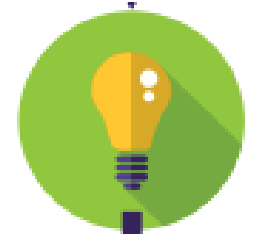
Hat	Job	Job Description
White	Information	Asking for information from others.
Black	Judgement	Playing devil's advocate. Explaining why something won't work.
Green	Creativity	Offering possibilities, ideas.
Red	Intuition	Offering and explaining hunches, feelings, gut senses.
Yellow	Optimism	Being positive, enthusiastic, supportive.
Blue	Thinking	Using reason, logic, intellect.

Make statement like: With my _____ hat on, I'd say _____.

For example: My blue hat thinks this idea is too heavy! With my black hat on, I would say this will take too much time. White hat says I can't decide – more information needed.

Final Evaluation of Solutions

Brainstorm,
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For each idea / solution, ask:

- Does this idea / solution break any laws of physics or nature – **yes** or **no**?

Rate the following 1-5, 1 is easy and 5 is near impossible

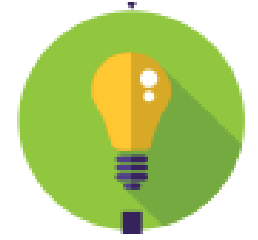
- Potential amount of assistance needed.
- How complex is the idea /solution?
- Potential Time issues?
- Potential Money issues?
- Other obvious issues you need to consider?

Discard ideas / solutions that will cannot be completed.

Or break your problem into a smaller part that can be completed this year!

Choosing the Best Solution

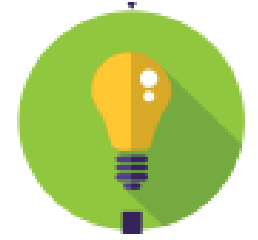
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- Look back at the criteria and your idea for solving your problem...
 - Which idea is most likely to work?
 - Which idea do you like the best?
 - Which idea seems out-of-reach but would be great if it could be accomplished?
- Look back at the constraints and ideas for solving your problem...
 - Which idea has the fewest constraints?
 - Which idea(s) have constraints that can be overcome?

To Do:

Brainstorm,
Evaluate, and
Choose Solution



Journal all work on project, including:

1. Brainstorm potential solutions to your 3 problems.
2. With input from you parents (teacher, mentor...) choose the problem you will solve.
3. For your chosen problem, pick ~3 different possible solutions.
4. Critique each solution using your Thinking Hats and answer the Final Evaluation questions.
5. Choose the solution you are going to use to solve your problem. Be sure to consult with your parents (teacher, mentor...) before making the final decision.
6. Record the Title of your project on the cover (or front page) of your Log-Book.

You now have your project!!!