Welcome!

Welcome to The Creative Parent’s Toolbox!
# What you will learn

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This training has a total of 6 module. Each module focuses on two areas:
(1) Basic tools to motivate children to learn and
(2) Basic Physics concepts that govern how our world works.
At the end of each module, you will be invited to pick one challenge out of 3, as you can see in this example.

- You should build it with your children or a group of children to practice the pedagogy and the physics of each module.
- Make sure you have at least one hour to build your own version of the design challenge beforehand so you will better understand where children might have difficulty, and be prepared to facilitate their learning at those points.
Let’s start! Our 1st module covers both Growth Mindsets (a key part of Curiosity Machine’s Learning Philosophy) and Physical Forces (key physics concept).
We will begin with learning more about learning mindsets -- or how different people think about learning and intelligence.

The brain is like a muscle -- the more you use it the stronger it gets. Researchers have found that we learn best when we make mistakes doing difficult tasks -- rather than repeatedly having success with easy ones. The best way that we can grow our intelligence is to embrace tasks where we might struggle and fail.

Curiosity, creativity, and persistence are important to building a Growth Mindset

Please take a moment to watch this video: https://youtu.be/U3nT2KDAGOc
By building engineering design challenges with children, you will learn many strategies to encourage the development of curiosity, creativity, and persistence—character traits which lead to better problem solving and critical thinking skills.

These are strategies that the most inspiring members of our society use to learn more about how our world works and to come up with innovative solutions to our world’s problems.
This comic illustrates two different understandings of learning and intelligence. How do you define “smart”: https://raouldify.files.wordpress.com/2012/04/calvin-hobbes.gif
## Fixed vs. Growth Mindset

<table>
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<tr>
<th></th>
<th>Fixed Mindset</th>
<th>Growth Mindset</th>
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</thead>
<tbody>
<tr>
<td><strong>Beliefs</strong></td>
<td>I was born smart</td>
<td>I can work hard and get and learn new things</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td>I want people to think I am smart</td>
<td>I want to learn new things</td>
</tr>
<tr>
<td><strong>Effort</strong></td>
<td>I had to work hard; I hope no one noticed</td>
<td>I worked hard. I am proud of that.</td>
</tr>
<tr>
<td><strong>Failure</strong></td>
<td>It’s not my fault</td>
<td>What can I learn from it?</td>
</tr>
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According to research by Carol Dweck there are two primary “mindsets” or ways to think about learning and intelligence.

A **fixed mindset** sees intelligence as something that *cannot* change. Common traits of those with a fixed mindset include:
- avoiding challenges
- giving up easily
- viewing effort as pointless
- ignoring feedback and feeling threatened by the success of others.

A **growth mindset** sees intelligence as something that *can* be developed. Traits of those with a growth mindset include:
- embracing challenges
- persistence in the face of setbacks
- viewing effort as the path to mastery, learning from criticism and being inspired by the success of others.

[http://2.bp.blogspot.com/-PFmS1kaS0N0/VESbvTiubEI/AAAAAAAAXx0/htjibcziqsI/s1600/Screen%2BShot%2B2014-10-20%2Bat%2B8.16.17%2BAM.png](http://2.bp.blogspot.com/-PFmS1kaS0N0/VESbvTiubEI/AAAAAAAAXx0/htjibcziqsI/s1600/Screen%2BShot%2B2014-10-20%2Bat%2B8.16.17%2BAM.png)
## How do Artists Think?

<table>
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<th>Fixed Mindset</th>
<th>Growth Mindset</th>
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</thead>
<tbody>
<tr>
<td>Mine isn’t good</td>
<td>What am I missing?</td>
</tr>
<tr>
<td>I’m awesome at this</td>
<td>I’m on the right track</td>
</tr>
<tr>
<td>I’m just not good at art</td>
<td>I’m going to train my brain and hands to do art</td>
</tr>
<tr>
<td>I hate making mistakes</td>
<td>Mistakes help me learn</td>
</tr>
<tr>
<td>This is too hard</td>
<td>This is going to take me some time</td>
</tr>
<tr>
<td>She’s so good at art!</td>
<td>I’m going to figure out how she’s doing it</td>
</tr>
<tr>
<td>This is as good as my work will ever get</td>
<td>What can I do to make it even better?</td>
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</table>
Take a minute to think about the statements you make to your child.

When do you encourage a fixed mindset and when do you encourage a growth mindset?
## Focus on the process, not the outcome

<table>
<thead>
<tr>
<th>Say This</th>
<th>Not That</th>
</tr>
</thead>
<tbody>
<tr>
<td>Praise the effort a child exhibits during a task</td>
<td>Avoid statements that suggest a child is “smart”</td>
</tr>
<tr>
<td>I like the way you tried all kinds of strategies on that design until you finally got it</td>
<td>Wow, you did great on that problem. You're smart!</td>
</tr>
<tr>
<td>That was long and hard, but you stuck to it and got it done. That's great!</td>
<td>See, I told you it would be easy for you! You're smart!</td>
</tr>
<tr>
<td>For the student who gets an A without trying: &quot;All right, that was too easy for you. Let's do something more challenging that you can learn from.&quot;</td>
<td>Nice job! You got an A without even trying.</td>
</tr>
<tr>
<td>For the student who works hard and doesn't do well: &quot;I liked the effort you put in. Let's work together some more and figure out what you don't understand&quot;.</td>
<td>Some people are just not good at math or science - don't worry about it.</td>
</tr>
</tbody>
</table>

This is **hard**!

It *is* hard! Let’s keep trying together!

The first thing you may have to respond to is “this is hard”. Try using “I don’t know the answer either! Let’s find out together!”
"I liked the **effort** you put in. Let’s work together some more and **figure out** what didn’t work”.

Your child may feel like they just can’t get it right. Encourage them to embrace their failed attempts as opportunities to learn.
I can’t do this!

I thought that I couldn’t at first, too! But I kept trying and got better. Maybe I can help show you how?

The first thing you may have to respond to is “this is hard”. Try using “I don’t know the answer either! Let’s find out together!”
I’m all done!

Great job! Let’s think about what we can do to make it even better!

“I’m all done” is another phrase you may hear, and you will want to encourage your child to keep trying and improving on the design or the task at hand. We can all use extra practice!
Example Phrases

- New projects are an opportunity to stretch
- Today your brain will get stronger
- After you do this, I’m going to ask you to share one mistake so we can learn from it.
- You and I don’t know how to do this. But together we can learn and do this challenge
- This is the first draft. We will have many chances to improve it.
- Mistakes help us learn what doesn’t work.

Now, start practicing your growth mindset by learning about the sciences that structure our universe. It may be hard at first, but remember to use some of the phrases you just learned!

Let’s talk about Forces, what is a force?
Forces can be described in two different ways. Forces can be a PUSH....
Or a force can be a PULL on an object (click for “Pull” to appear)
Wait a minute. Aren’t there different kinds of forces?

So, right now you might be thinking -- “Wait a minute, there are a lot more forces, right?” (click animation) “Aren’t there different kinds of forces?” And, you’re right. There are. But all of these forces either push or pull. However, there are different types of pushes and pulls.
There are quite a few forces that you probably know but didn’t realize what they were. Look at this image and think what is this force?

Well, Gravitational force! Objects fall because of gravity, which is a force that pulls things to the ground.
How about this one? Have you ever thought about a spring moving up and down or this trampolin? This is a type of force called a “Spring” force or an “Elasticity” Force! A spring force is a push or pull that returns to its previous state after being pushed or pulled. Like when you pull a rubber band and let it go, it pushes back to its original state.
And this? This is a force that most of us have played with, a Magnetic force! Magnets either push or pull each other based on their magnetic attraction.
Every action has an equal and opposite reaction

For every action, there is an equal and opposite reaction!

If you have a balloon, blow it up but don’t tie the end. When you let the air out of a balloon, the air shoots out in one direction and the balloon flies off in another! (if audience has a big reaction to the balloon shooting everywhere, for fun you can comment on the relationship between our action and their reaction, too)
So, we’re going to play a quick game called “What’s going on here?!”. It’s pretty simple, we’re going to watch some video clips and try to identify where a force’s action is, and what the equal but opposite reaction is. **This is a great game to play as a family while you watch America’s Funniest Home Videos.**
Smoke shoots back, skateboard goes forward

(Play from 3:40 to end)

What is going on here?
Water shoots down, bottle goes up

What is going on here?
The action here is that the exhaust is pushing the ground. The reaction is that the shuttle rises from the ground. Pretty cool right?
Eggs hit ground, ground hits eggs back
Ball hits ground, ground hits ball back. Ball is elastic & doesn’t break, but changes shape

Why doesn’t the ball break? Isn’t it the same as the egg?
By reducing the thrust, the gravitational force is greater than thrust and the rocket slowly comes down

(SpaceEx Grasshopper)
Let’s Review

- Forces push and pull
- For every force there is an equal and opposite force (action and reaction)
- Modify forces by changing balance and distribution
Congratulations!
You just finished the first module!
Now it’s time to really use what we’ve learned.

Pick one of these design challenges to develop a deeper understanding of how forces work.
How can you use one of these design challenges to help explain Forces?

Use strategies to develop a growth mindset in your child while working on the challenge.

Share your work on CuriosityMachine.org.