The Three Pigs

Once upon a time there were three young pigs. They lived with their mom next to the barn on the farm. They hated having her tell them they should do something more productive than playing video games, and bugging them that they ought to eat something other than pizza all the time, and telling them to go to bed early and not sleep the day away.

So they decided to build their own house. They weren’t really interested in making a great house, just somewhere they could play games and eat pizza when they wanted, and to stay up all night and sleep in late if they wished.

The farmer had recently cut the grass in the pasture, so they decided to use the grass to make a house. They rolled the cut grass into mats, and then made walls of grass, and a roof of grass, and a door of grass. They house was built quickly in the morning, and they moved in and started playing games. As it got late in the afternoon, they were hungry and ordered a pizza. So as the sun went down and they heard a knock at the door they thought it was the pizza delivery. But a voice on the other side of the door said, “Little pigs, let me in!”

Could it be? Their mom had told them about the big bad wolf, but they thought she was just trying to scare them. “Not a chance big bad wolf,” they yelled, but they were scared.
“Then I’ll huff and puff and blow your house down!” said the wolf outside. He took a big deep breath and the blew very hard.

The walls fell in, and the roof fell on top of it. The pigs squealed and squirmed, trying to get out from under the grass mats and away from the wolf. Lucky for them the wolf was a bit out of breath, and they got away and ran back to their mom’s house. They didn’t tell her what had happened.

The next day they decided their house needed to built of stronger stuff, and they gathered sticks. Then they made walls of sticks, and a roof and door of sticks, and moved right in. Playing their games, again they ordered pizza, and again as the sun went down they heard a knock at the door.

It was the wolf again—“Little pigs, let me in!”

This house was stronger, but would it protect them? They put down their games and yelled, “Not a chance, wolf!”

“Then I’ll huff and puff and blow your house in!” The wolf took a deep breath and blew. The sticks scattered everywhere, leaving the pigs exposed. They squealed and ran home, just ahead of the wolf, who was a little winded. They still didn’t tell their mom what had happened, but she might have known.

When they awoke the next day they found books about construction methods and materials, and project management in their room. They read and researched and learned all they could
over the next few days, and then made plans for a real house. They decided on brick walls, with
a slate roof, and a strong oak door. It took them more than a week to build this house, and they
returned to their mom’s every night while they worked on it. They even built a pizza oven in the
kitchen so that they could make their own pizza!

Soon enough it was done and they moved in. The first day they had moved in they were playing
at their games and they heard a knock at the door. They waited, then they heard the familiar
voice, “Little pigs, let me in!”

This time they said with confidence, “Not a chance, wolf!”

“Then I’ll huff, and puff, and blow your house down!” The wolf took a deep breath, and blew very
hard.

Nothing happened. He was very angry! This had never happened before!

He took an even deeper breath, and blew harder than he ever had in his life.

On grain of sand blew out of the mortar between two bricks, and a single leaf fluttered from the
rain gutter. That was all that happened.

The wolf was so mad! And he smelled something delicious. He stepped back and saw the
chimney on the roof. Leaping up to the roof, he slid and slipped on the slate roof, but made his
way to the chimney. He tried to slip into it, but it was hot, and the pigs had installed a proper
scrubber to prevent pollution from their wood-fired pizza oven. Burning his paws, the wolf
howled in pain, sliding off the roof with a thump. Stunned, he lay there for a minute before limping off towards the woods.

The pigs checked their pizza, and it was ready. After eating they returned to their games. But after a couple of weeks of seeing how good it was to spend the day working, they went to bed early and got up around sunrise.

With their newly acquired knowledge, skills, and confidence, the pigs got a contractor’s license, and began building houses for other animals in the neighborhood. With these lessons learned, and a good plan for the future, the three pigs lived happily ever after.

*What did the pigs learn in this process?*

*Had the pigs clearly identified the problem they needed to solve at the beginning?*

*What did they have to do once they had identified the problem to be solved?*
Asking a good question

The early 1900s were an exciting and fruitful time for biologists. The evidence supporting descent with modification (Darwin's phrase for evolution) of all organisms from related ancestors was clear. However, the mechanisms that made it happen where still a mystery. It was not yet clear how organisms inherited features from their parents, and the molecular basis of most biological processes and structures were still unknown.

One scientist of the time felt that there was too much emphasis on breaking cells and whole organisms apart and focusing on their components. He believed that to really understand what made cells work you had to study them in their real environments. There were others who had the same perspective, but one of the things that made Ernest Everett Just successful was that he found, within the opportunities available to him, the right questions to ask. These questions led to investigations that produced evidence to support Just’s ideas.

Just was an African American student at Dartmouth, and graduated with a bachelor’s degree in 1907 to career choices that were limited due to racism. He got an appointment to teach at Howard University where he had no resources or time to do research. In his first year at Howard he met the head of the Zoology Department at the University of Chicago, who was also the director of the Marine Biological Laboratory at Woods Hole in Massachusetts. He got a job working summers as a research assistant at Woods Hole, where he studied the eggs of marine worms. He wanted to know exactly what happened in an egg to make it start developing. Everyone knew that it required a sperm cell to get the process started, but Just asked what exactly did the sperm do to the egg, and what were the series of cellular changes, and how did they make a single cell start dividing to make a new multicellular organism. Just studied this for decades at Woods Hole, and laboratories in Europe. His career was eventually frustrated by the
limitations that society placed on black people at that time. But his ability to ask a question that fueled great research left a legacy for us to learn from.

**Solve your own problem**

There are plenty of simple design projects, many that you probably do already. My favorite for following this story is House of Cards. It is low-prep, engaging, and focuses on the Design Process.

Give each group a pack of index cards. Set them the task of building the biggest ‘House.’ This is a messy, vague assignment, i.e. the problem they are trying to solve is not clear. Encourage multiple trials. If you have enough time, change the parameters—build the strongest, or it must have a round foundation. Have them investigate how limitations and design requirements change the outcome. Discussion is very important. Why did they have different solutions? How would they have built if the instructions were more clear?

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