

Launch Creativity with Ping-Pong Ball Challenge



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FOR about a year now, we have worked together to bring invention information and activities to life at Thomas A. Edison Middle School, which is located just about a half mile from the legendary Thomas Edison National Historical Park. One activity in particular, our Ping-Pong Ball Invention Challenge, has proven a great success.

The Challenge

Our Ping-Pong Ball Invention Challenge was inspired by the basic rules

for PBS's *Design Squad's* "Pop Fly" activity (http://pbskids.org/design_squad/parentseducators/resources/pop_fly.html). We broke the class into teams of three to four students and gave them the task of propelling a Ping-Pong ball into the air as high as possible so other students could catch it. The catch was that in propelling the ball, the students could not touch the ball with their hands. In other words, after the students placed the ball on their launching apparatus, it was hands off!

Each team received some start-up

materials to kick off the invention challenge. These included a wooden paint stirrer (stick), a ruler, three small wooden blocks of different dimensions, a 12" strip of duct tape, a pad of paper, scissors, and a Ping-Pong ball.

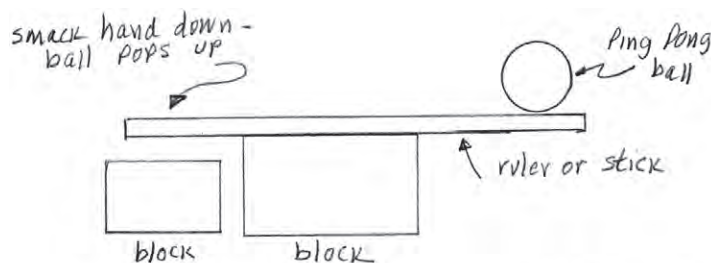
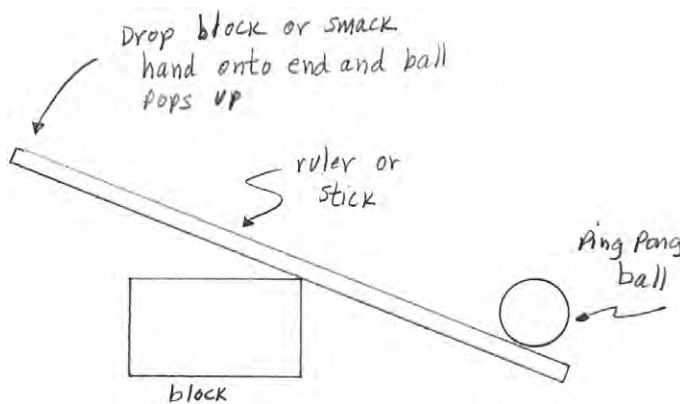
We encouraged the students to spend some time thinking about possible solutions to the challenge before plunging in and trying to launch the ball. We also encouraged them to adopt an inventive spirit that included never giving up but keeping at it no matter the results of their experimentation. We often repeated a famous statement by Thomas Edison that is painted on one of the walls in the school's hallway: "I haven't failed—I've found 10,000 ways that don't work." This reminded the students that the great inventor never gave up on his many invention challenges. Harry also showed students some of his own inventions and provided examples of how he had failed many times in the course of his work.

Making It Happen!

The students' energy level went through the roof as they got out of their chairs and began working together on ideas. Students produced a good variety of possible solutions to the challenge—with some striking us as quite ingenious. We discuss some

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Fig. 1



the two-block approach keeps the ruler or stick from flying off after the ball.

Fig. 2

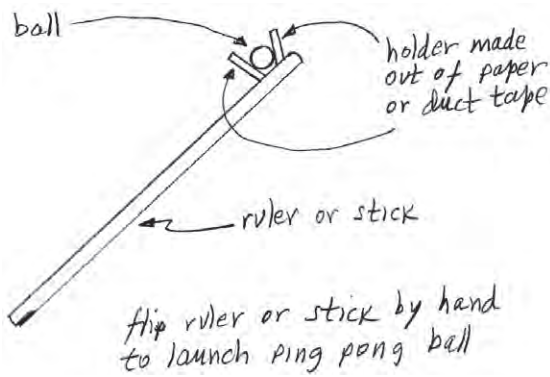


Fig. 3

of them here, illustrated with some photos and drawings.

Figure 1 is a fairly obvious solution that uses a block and a ruler or paint stirrer in a cantilever arrangement. Students used their hands or dropped a block on the cantilever to produce the downward force necessary to put the ball in flight. They quickly figured out that dropping a block from a higher vertical distance imparted a greater force to the end of the cantilever.

Using the ruler/paint stirrer in this fashion did, however, cause the cantilever to fly off as well. Since the

students had been discussing Newton's laws, Ms. K. had them relate this design problem to material they had recently discussed in class. And we encouraged them to come up with a different arrangement that would prevent having sticks flying in the classroom. Figure 2 was one possible solution to address the potential safety concern.

Another solution that students came up with involved using paper or duct tape to make a little cup at the end of the stick to hold the ball in place prior to launch. Students with this solution moved easily into a game of catch (Fig. 3).

The solution shown in Photo 1 was unique, involving a horizontal force that propels the ball upwards. The key here was keeping the duct tape from sticking to the ball placed in its starting position. No other team came close to duplicating this block-and-tape idea. Figure 4 was

another unique solution to this challenge, also not duplicated by any other teams.

A Sudden Change in Plans

After some experimentation, we called the teams to order to discuss what they had learned thus far in their inventive activities. Frequent comments included:

- How much success with this challenge depended on teamwork.
- How much fun the challenge was.
- The importance of learning from mistakes.

After some discussion, the challenge continued, but this time Harry announced that the students had to remove the blocks from the starting materials and re-design a solution without them.

Spurred on by another favorite Edison quote—"Fail your way to success"—the students put the blocks in the middle of the tables and started trying new designs. Most quickly reverted to the comfortable cantilever design they used early on, but we encouraged them to be creative and develop new approaches. Photos

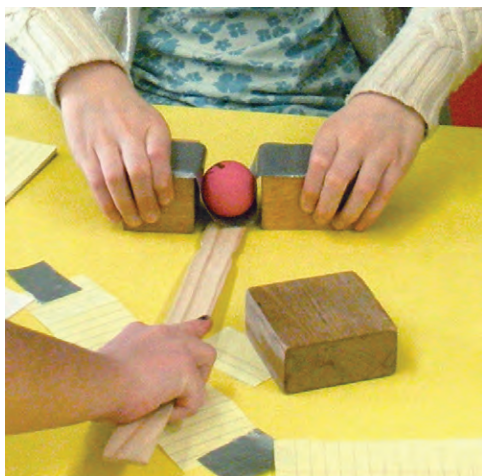


Photo 1

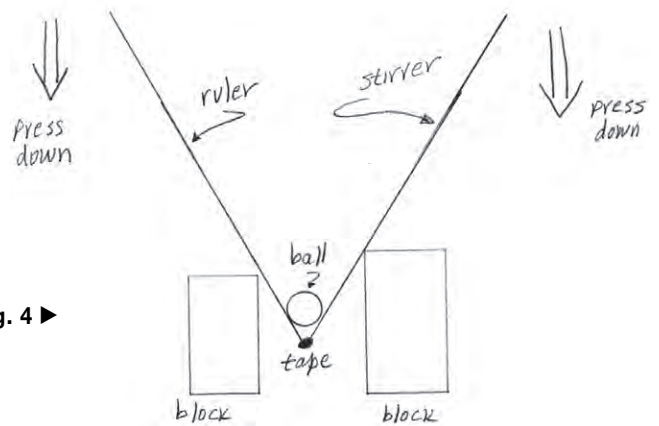


Fig. 4



Photo 2

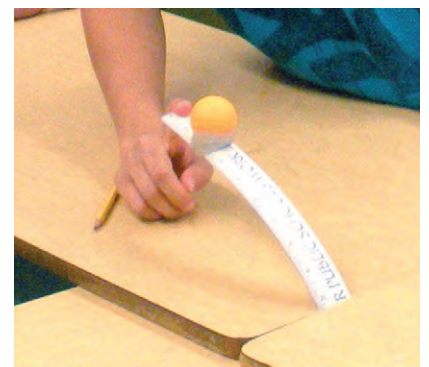


Photo 3



Photo 4

2 and 3 show some of the fallback designs.

One unique approach (Photo 4) involved using the friction a person can create by squeezing the Ping-Pong ball between a ruler and the stirrer and forcing the ball to pop up. While the idea was creative, the ball was usually sent off in unanticipated directions with terrific “English,” or spin. Another team created a different kind of game, launching the ball toward buckets placed on the floor. (See Fig. 5.)

Close to the end of the class,

we had the students clean up their workspaces and sit down to discuss their experiences. Their comments included:

- Without the blocks we had to start over again!
- We can invent games using stuff or “junk” that is just lying around.
- If we keep experimenting at home, we can’t say we’re bored!
- Don’t give up and you will eventually create something that works.
- Invention activities are a cool way to learn and remember things.
- Some of what we learned from this challenge can be used anywhere, not just in the classroom and not just with Ping-Pong balls.
- You can see Newton’s laws of motion in how the ball-launching inventions work.

Future Activities

In the coming months, we plan to have students document their creative efforts in an invention notebook. Harry will again meet with the students to help get everyone prepped for this activity. His presence as a “real inventor” adds a level of energy and interest to the students’ design/invention projects. The students will also participate in a school-wide Design Challenge at the end of the school year. ©

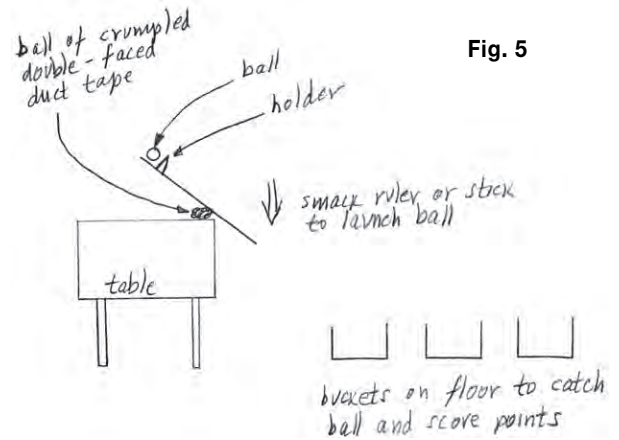


Fig. 5

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