The Art of Getting it Wrong

Developing Persistence

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The Illinois Mathematics and Science Academy
Statewide Educator Innovation
Who Are We?

• Public Residential Math and Science Academy, grades 10-12

• Educator outreach within Illinois, across the country, and globally
Objectives:

• Understand how including opportunities for failure in the classroom is beneficial to learning
  • Executive Function Skills
  • Growth Mindset

• Explore a technique to develop the skills needed to solve problems through error analysis
Executive Functioning and Persistence

- Fluency: Processing and Working Memory
- Organization: Planning/Prioritizing
- Control: Self-monitoring and Regulation
- Mental Flexibility:
  - Changing Perspectives
  - Changing Attention
Growth Mindset and Persistence

GROWTH MINDSET
- Analyze mistake
- Accept challenges
- Ability to learn new things
- Inspired by others success

FIXED MINDSET
- Unchangeable aptitude
- Avoid challenges
- Avoid failure
- Give up easily

https://www.linkedin.com/pulse/fixed-mindset-vs-growth-ilyas-nadeem
Persistence and *The Gifted Student*

May have little experience with failure

Asynchronous development:
- Gifted but still a kid
- Are they gifted in every subject?

Be twice-exceptional and have a diagnosis like ADHD
Consider This:

What is your initial reaction to this problem?

There are 32 teams in a sports league. Each has played three games. FIVE teams are WINLESS, and TEN other teams have a record of 1-2 (1 win, 2 losses). HOW MANY TEAMS are UNDEFEATED? Ties do not apply.
Let’s Try This Problem

Multiply and/or combine like terms:

$$4x (2x - 9) - 2 (5x - 6)$$
Instructional Technique: “My Favorite No”

Background: Students were given an opener - the math problem you were provided. Observe the technique:

https://www.youtube.com/watch?v=srJWx7P6uLE
Instructional Technique: "My Favorite No"

1. Provide a problem to solve
2. Teacher chooses a favorite wrong answer and rewrites the “Favorite No” for the class to see
3. Analysis of problem as a class:
   • Celebrations (what was correct in the answer)
   • Where did it go off course
4. Derivation of correct answer as class
“My Favorite No”: Thoughts

• How might this technique address persistence?

• Let’s look at how we can adapt for varied content
“My Favorite No”: Applications

Science
• Chemistry or Physics Equation
• Science Concept
• Vocabulary

Social Science
• Dates and Names Connected to Events
• Geography
• Branches of Government

ELA/Literacy
• Claim Evidence Reasoning
• Vocabulary
• Proper Annotation or Formatting

Foreign Languages
• Misconceptions
• Vocabulary
• Grammar

Grading Strategy
https://www.youtube.com/watch?v=BO2gndc4d9I&t=2s
Introduce Necessary Points of Failure

Do activity prior to learning content

Don’t provide all the essential information
Early travelers relied on wood materials to build ships designed for trade and transport. Ship-builders became adept at maximizing space and modifying existing materials for use.

**Challenge:** Build a ship that can float in water while containing steel balls. Maximize useable space (the more steel balls the ship can hold, the better). Specific materials are provided. The design must follow the constraints listed below. **Instructor approval of all designs is necessary prior to building.**

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**Provided Materials**

- 3 Craft Sticks
- Glue
- 10 Small Steel Balls
- 1 Tub of water (per class)

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**Design Constraints:**

- Design (*plan and draw*) your boat first, before building. **Your teacher or instructor must approve your design prior to building.**
- You may use a maximum of 3 craft sticks.
- The primary material used for the boat must be the craft sticks, glue may **ONLY** be used for connecting the sticks together.
- The craft sticks must be bound to each other
- The craft sticks may not be cut or broken.
- The boat must float while holding the steel balls. The boat must contain the steel balls at all times (they must not be able to roll out of the boat).
Are you ready to tackle this problem?

There are 32 teams in a sports league. Each has played three games. FIVE teams are WINLESS, and TEN other teams have a record of 1-2 (1 win, 2 losses). HOW MANY TEAMS are UNDEFEATED? Ties do not apply.

How would you tackle this with your students?
FYI – The Math Behind the Answer

<table>
<thead>
<tr>
<th># Teams</th>
<th>Wins</th>
<th>Losses</th>
<th>Total Wins</th>
<th>Total Losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>2</td>
<td>(10 x 1) = 10</td>
<td>(10 x 2) = 20</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>3</td>
<td>(0 x 3) = 0</td>
<td>(5 x 3) = 15</td>
</tr>
<tr>
<td>X</td>
<td>2</td>
<td>1</td>
<td>(2 x X) = 2X</td>
<td>(1 x X) = X</td>
</tr>
<tr>
<td>Y</td>
<td>3</td>
<td>0</td>
<td>(3 x Y) = 3Y</td>
<td>0</td>
</tr>
</tbody>
</table>

48 = 20 + 15 + X
48 = 35 + X
48 – 35 = 35 – 35 + X
13 = X

Plug in X to Find Y with Total Win Equation:
48 = 10 + 2X + 3Y
48 = 10 + 2(13) + 3Y
48 = 10 + 26 + 3Y
48 = 36 + 3Y
48 – 36 = 36-36 + 3Y
12 = 3Y
4 = Y
Take Small Steps...

**Messaging**
- Do a Self Check
- Set the Tone
- Consistent Messaging

**Opportunities**
- Low Stakes Failure
- Celebrate the Good (when analyzing errors)
Thank You!

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Please tell us how we did!

3 Hour Micro Certification courses:

Coming Soon: The Art of Getting it Wrong:
Developing Persistence

[QR Code]