



Re:Create

~Unlocking Creativity with Waste~



Nara Prefectural Kokusai Junior and Senior High School

Background

Mathematical Thinking Skills

National Academic Assessment:

This survey is conducted by MEXT each year to assess and analyze the academic skills and learning progress of students nationwide.

According to recent trends in junior high school mathematics performance, the correct answer rate has generally remained flat or shown a slight downward trend. In the 2025 academic year survey, the correct answer rate for 3rd-grade mathematics fell below 50%.

Analysis of the survey results indicates that "the ability to apply knowledge and skills" is identified as an area needing improvement. Compared to questions that simply test the presence or absence of knowledge, challenges tend to be observed in questions that assess the ability to apply knowledge and skills in various real-life situations or to formulate plans for solving problems.

In today's rapidly changing society and living environment, it is essential to enhance one's "thinking, judgment, and expression skills"—the ability to identify challenges independently, proactively devise solutions, and collaborate with others to create new value.

Environmental awareness

SDGs (Sustainable Development Goals):

SDGs are the global goals adopted at the UN Summit in September 2015.

They serve as a roadmap for action to achieve a sustainable and better world by 2030, leaving no one behind.

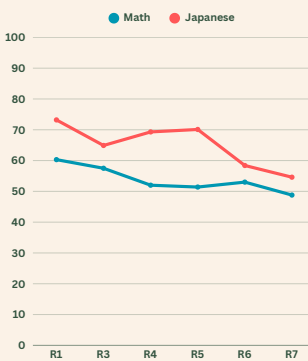


The deadline for achieving the SDGs is fast approaching. To realize a sustainable society, consideration for the environment is essential, not just economic development.



MEXT:
Ministry of education,
culture, sports, science, and technology - Japan

Average Correct Answer Rate Trends [%]



<https://www.nier.go.jp/kaihatsu/zenkokugakuryoku.html>

Created based on data released by MEXT.

※The survey for fiscal year R2 was postponed due to COVID-19.

Details

The study we work on: **How to improve students' ability of thinking**

The definition of Thinking Skills:

Information Organization Skills / Multifaceted thinking ability / Concretization ability etc...

Purpose of our inquiry:

- We aim to improve students' mathematical thinking skills while boosting their motivation to learn and environmental awareness by creating teaching materials made from waste and having them interact with creations.

Research Question:

- What kind of teaching materials can achieve the development of mathematical thinking skills in them while also contributing to increased motivation to learn and environmental awareness?

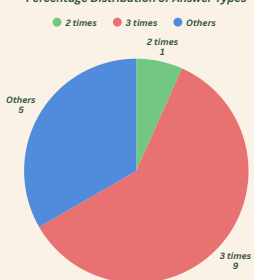
Method



There're 9 coins. One of them is fake and is heavier than the others.

Using a balance scale, find the minimum number of weighings needed to identify the fake coin for sure.

Percentage Distribution of Answer Types



Interview: What were you thinking about while doing it?

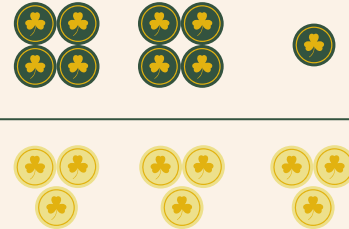
It'll be easier to find if I put as much as possible on it.
14years—3 times

I'd be happy if the one left unweighed on it turned out to be the fake.
14years—3 times

When the scale balances, the group not placed on the scales contains the fake.
15years—2 times

Explanation

How should we divide and consider the nine coins?



Which way is more efficient?

A single measurement yields three different results on the scale.



Dividing the nine gold coins into three groups of three each makes it easier to understand.

If the scale tilts

→ the heavier side holds the fake.

If the scale is balanced

→ There's the fake among the group not placed on it.

Similarly, divide three coins into 1:1:1 portions.

If the scale tilts

→ The heavier one is the fake.

If the scale is balanced

→ The one not on the scales is the fake.

Ans. 2 times

Conclusion

The scales are merely one example for measuring thinking skills.

Even teaching materials made from everyday trash can elicit similar thinking by encouraging the organization of conditions and shifts in perspective.

What matters is not the sophistication of the teaching materials, but whether thinking can be designed.

Moreover, the act of "making" itself will cultivate thinking skills. Creating things from waste not only raises environmental awareness but also enhances one's ability to think.

By making these teaching materials available to middle school students, we will cultivate the habit of thinking among them and eliminate the abandonment of thinking in mathematics.

