

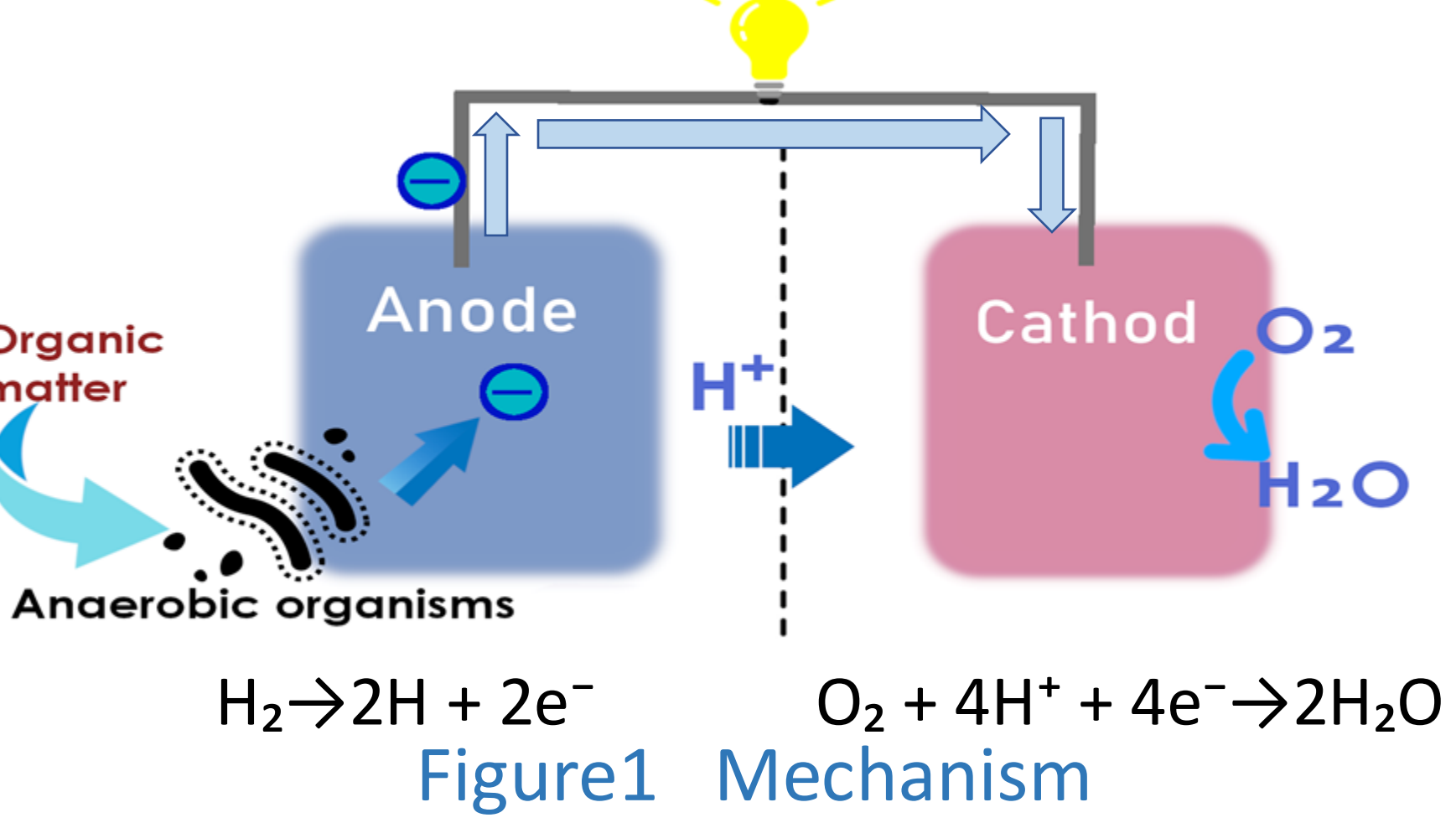
# Effectiveness of Generating Electricity by Microbes and Applications of Household Items During an Emergency

Hyogo Senior High School C8



## Microbial power generation

It is a fuel cell that uses hydrogen produced by micro organisms. This microorganism is **anaerobic**. In previous studies, paddy soil was used as a power source.



**Advantage**  
It is eco-friendly.  
No special materials are required.

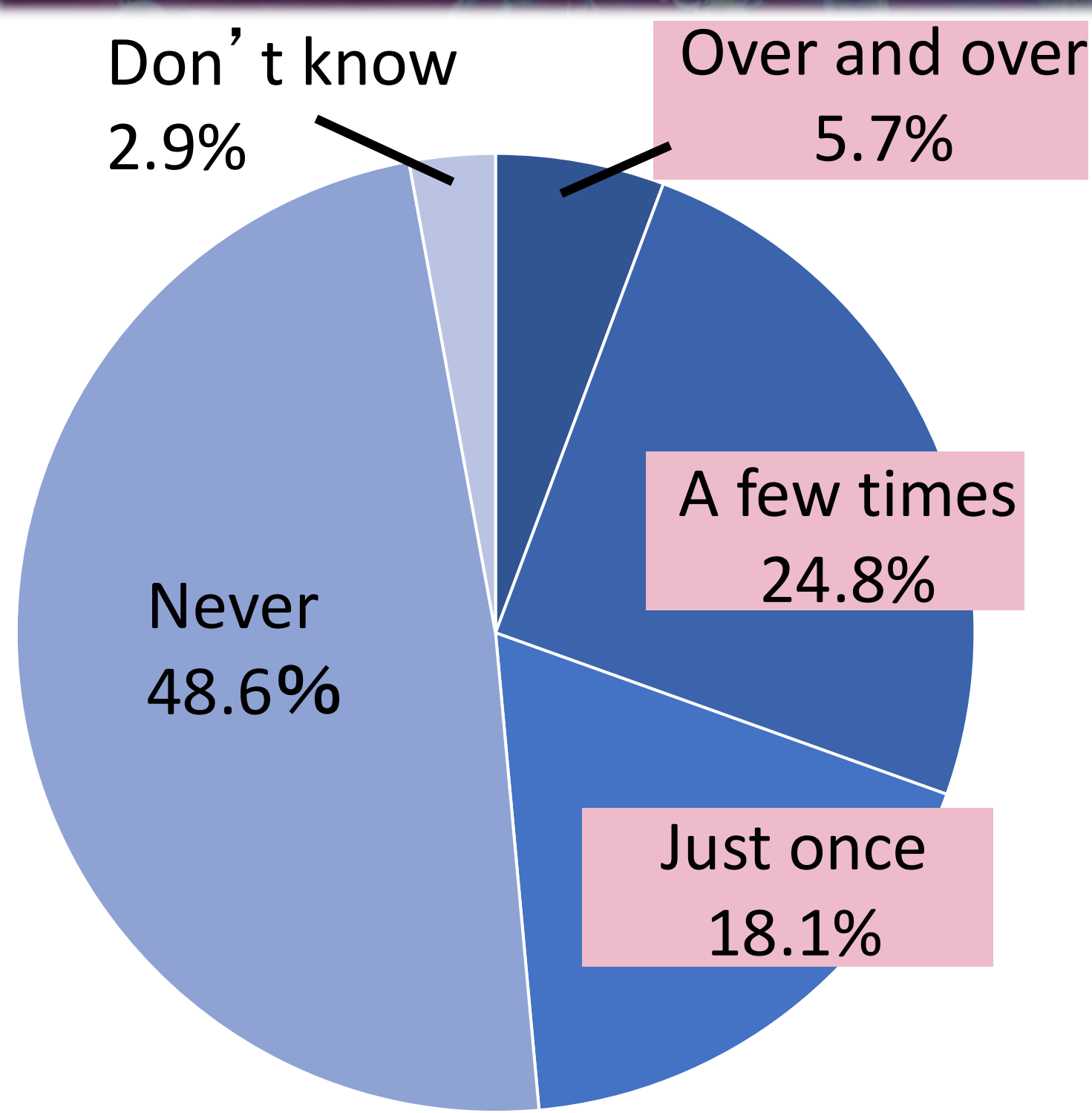
**Disadvantage**  
It generates little power and has low efficiency.

## Purpose

During disasters, it is **difficult** to continue living without access to electricity.

Generating electricity with **everyday items** that can be used even during disasters.

Find ways to **increase power** output to enable practical use.



**Figure 2 Have you experienced trouble during a power outage?**

出典 [独自レポートVol.15]【子供を持つ親に聞く停電への備え】89.4%が、災害時の「停電」への備えの重要性を実感！対策として家庭用蓄電池に81.8%が関心～蓄電池を使って優先的に使いたい家電が明らか！～ | 国際航業株式会社 (2024/12/6)

## Hypothesis

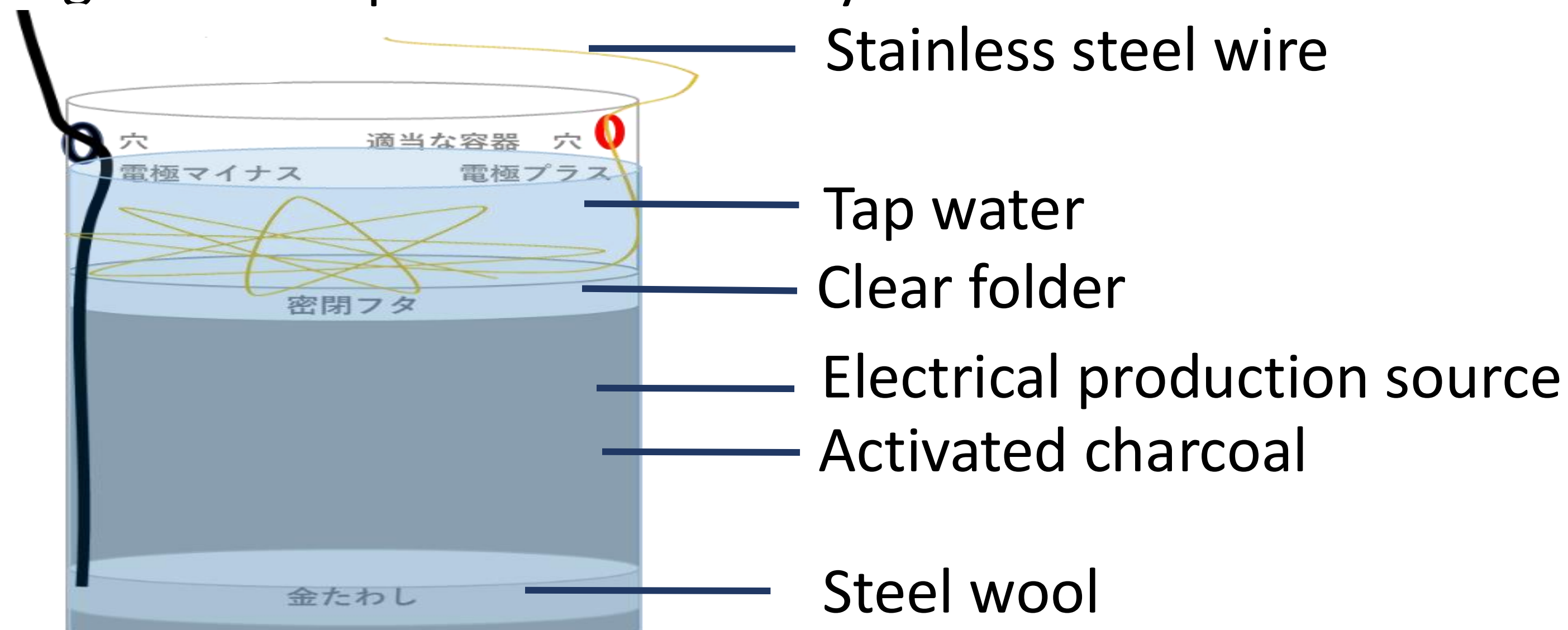
- Anaerobic organisms that generate electricity are in soil at our high school as well as paddy soil.
- The amount of electricity is increased by organic matter (We used sugar in this research).
- Bifidobacterium, one of the **anaerobic** organisms in the yogurt, are able to generate electricity.



**Picture 1 soil at Hyogo High School**

## Experiment

### ① Making device to produce electricity



**Figure 3 Device for microbe power generation**

出典 微生物で発電しよう！……？ | 各種資料 | 優日堂

### ② Observation

Measure voltage with multimeter every day for ten days.

### ③ Examination of whether the iron dissolve

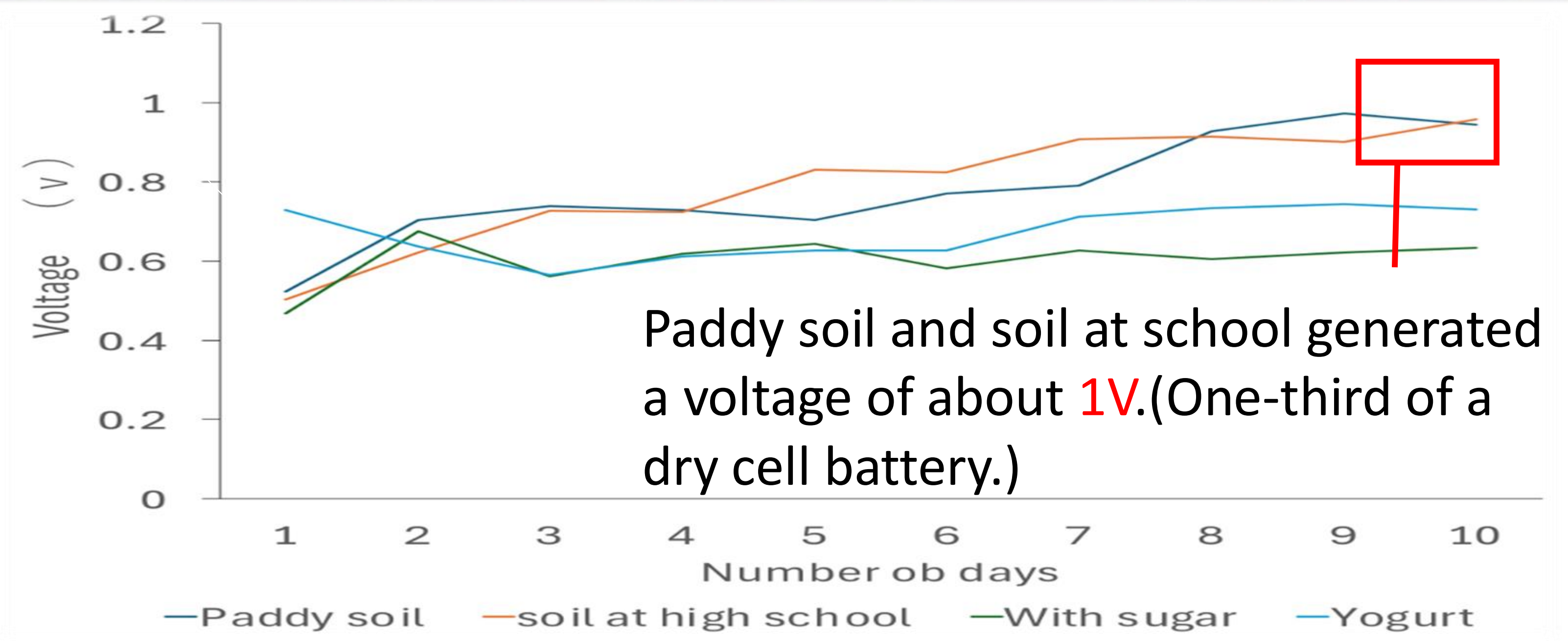
Stainless is weak against acidity.  
Measure pH of filtered liquid inside the device.  
Also, sodium hydroxide solution put in liquid a examine sedimentation.

If sedimentation is observed, the iron might dissolve.



**Picture 2 Weigh Sodium Hydroxide**

## Results



**Figure 4 Changes in voltage**

**Figure 5 Solution Change**

Source	Paddy Soil	School Soil	Soil and Sugar	Yogurt
pH	6.4	6.3	5.8	5.1
After Filtration				
After Titration				
Sediment	×	×	○	○

Close to an acidic value.

## Consideration

### 1. Soil at school

- No precipitation occurred.
- The pH is close to neutral.
- About 1V was generated.

It is possible to generate electricity using soil at school.

Three devices in parallel = One dry cell battery



### 2.3. With sugar and Yogurt

- Precipitation occurred.
- The pH is close to acidic.
- Yogurt did not show a significant increase in voltage.

Power generation was not from microbial but from metal dissolution.

The presence of anaerobic microorganisms alone does not result in microbial power generation.

- Soil organic matter consists of plant and animal residues.

Not all organic matter is suitable.

- Soil with sugar did not show a significant increase in voltage.

## Conclusion

During disasters, When taking shelter at a school, electricity can be generated using microbial fuel cells from the school's soil. Going forward, we aim to explore ways to increase power output by switching energy sources for practical use.

## Citations

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