

An Approach to Developing Writing Skills in Scientific English

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Desire and Need

Students:

- Desire to have skills to write and read English documents,
- Feel frustrated at having to spend time to master English as second language to communicate in English.

Society:

- Needs more and more scientists and engineers who manipulate scientific English.

One Approach for Developing Writing Skills

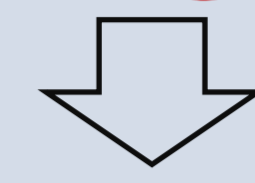
Physical objects and moving images are useful topic materials, instead of Japanese texts, for developing writing skills in English.

Learning through visualized tools:

- attracts and motivate many students,
- can avoid Japanese texts and translation, and creating a less Japanese environment.
- easily leads to advanced learning of topics relating to the latest and basic technologies, which makes the English learning engagement of students central or close to central to the study of their discourses.

Process 1

= for writing skill basis



Students take the following steps:

(1) **Observe** a real or pictured object, and understand the mechanism of it.

(2) **INPUT** See teacher demonstrating how to write their understanding into concise English sentences.

Learn that scientific English can be basically expressed in sentences of simple formulae: S+V, S+V+C, and S+V+O.

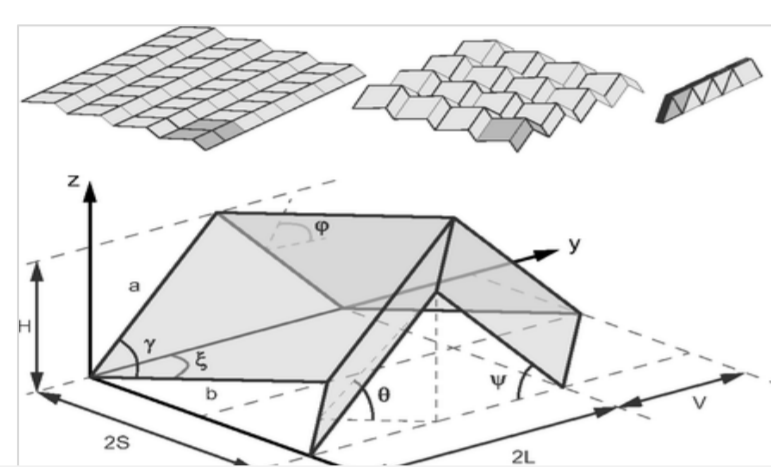
(3) **OUTPUT** To describe the object, **Determine** the appropriate a subject, a verb, and an object in each sentence, based on the object, not Japanese.

Notice the need for increase in vocabulary and expression ways.

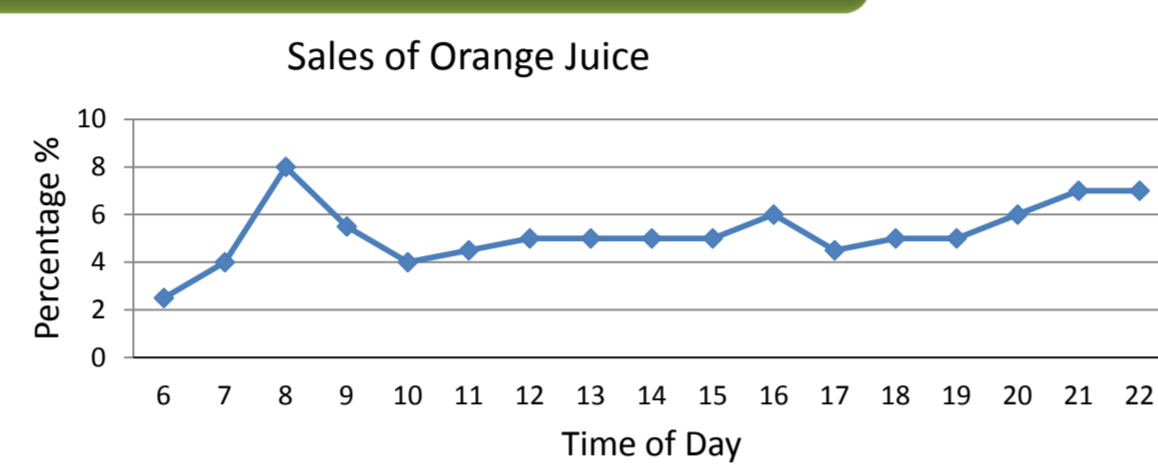
(4) **INPUT** **Get feedback** and comments from teacher, inspired for more knowledge.

(5) **Repeat** writing on different topic materials (see examples on the upper left), through the above input and output process.

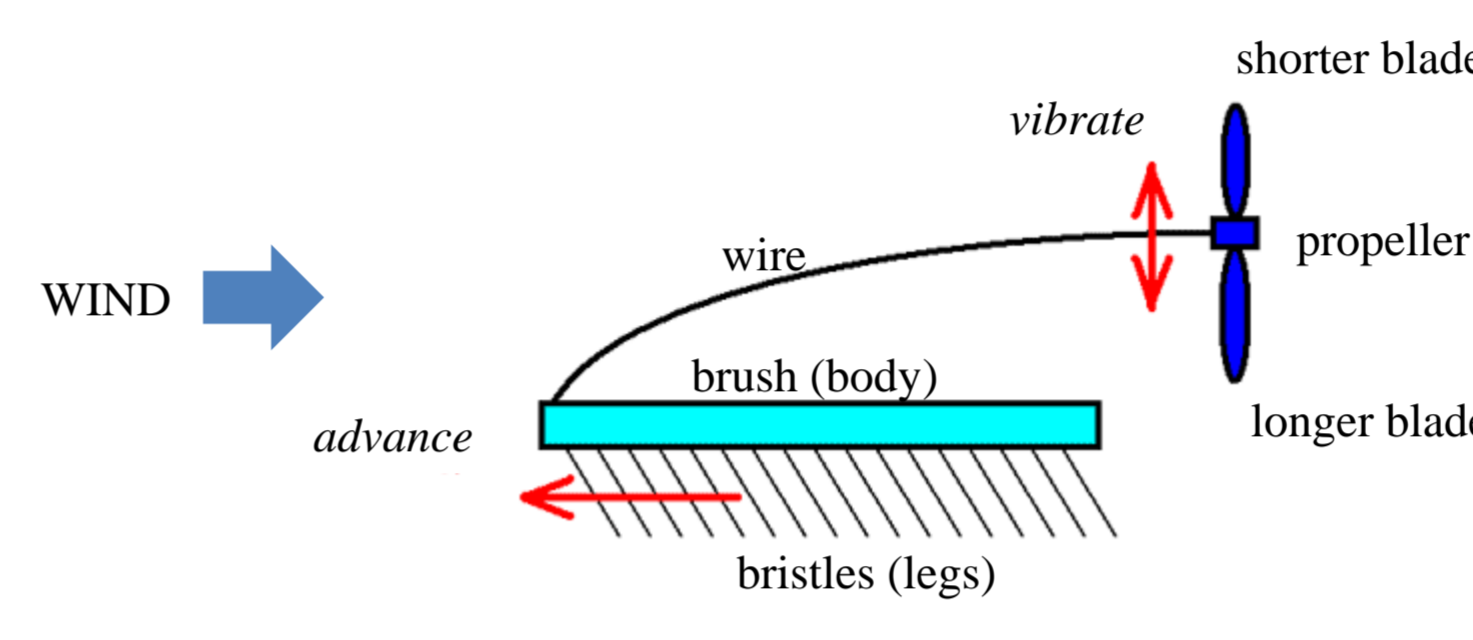
Examples of Topic Materials in Process 1



Miura-ori (origami engineering)



Data using face recognition technology



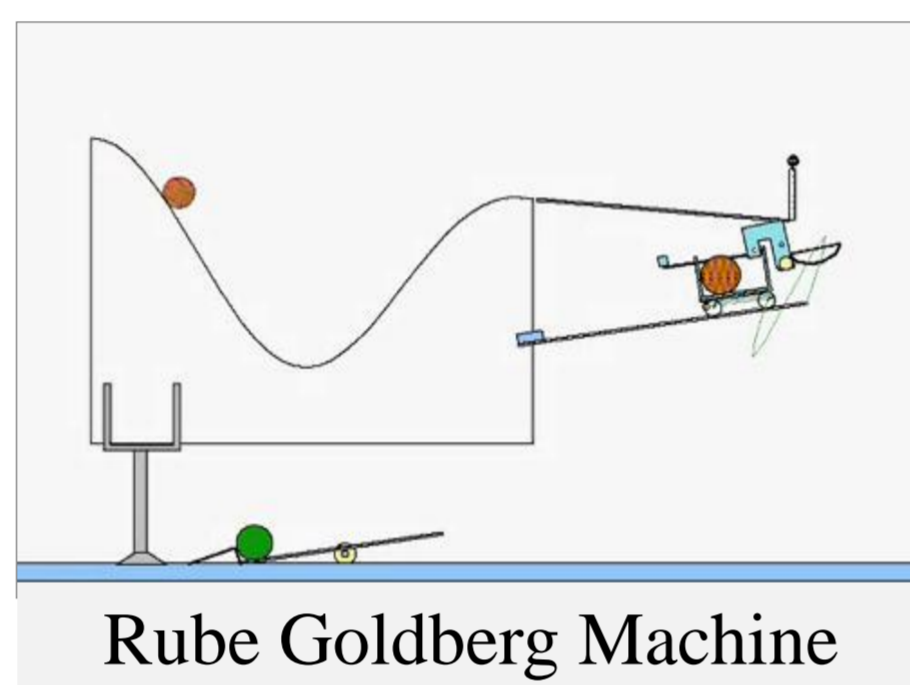
Wind car



Balloon helicopter



Robotic gripper hand



Rube Goldberg Machine



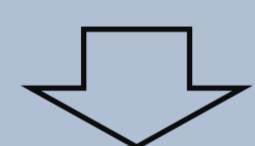
Construction Site Accident



Fluid in raw eggs

Process 3

= For proof that their skills reach the level to read and write research papers



(9) **Learn** the structure and hint expressions of moves in the parts of a research paper.

(10) **Practice writing** of appropriate sentences in each part.

(11) **Analyze** the moves in the abstracts of papers as many as possible.

(12) **Write an abstract** of a sample research paper.

(13) **Make a poster** of a sample English paper.

(8) **Become capable of making paragraphs** of structure, operation, mechanism, and process.

(7) **Combine and rearrange** clauses and sentences to make them coherent and logically and organically connected.

(6) **Actively write sentences** that clearly carry their intents on topic objects that are more specific to their discourses than those in process 1 (see examples below left), and on their original idea, product, or system (see examples below right)

The **input-output work** is continued in Process 2 for individual student.

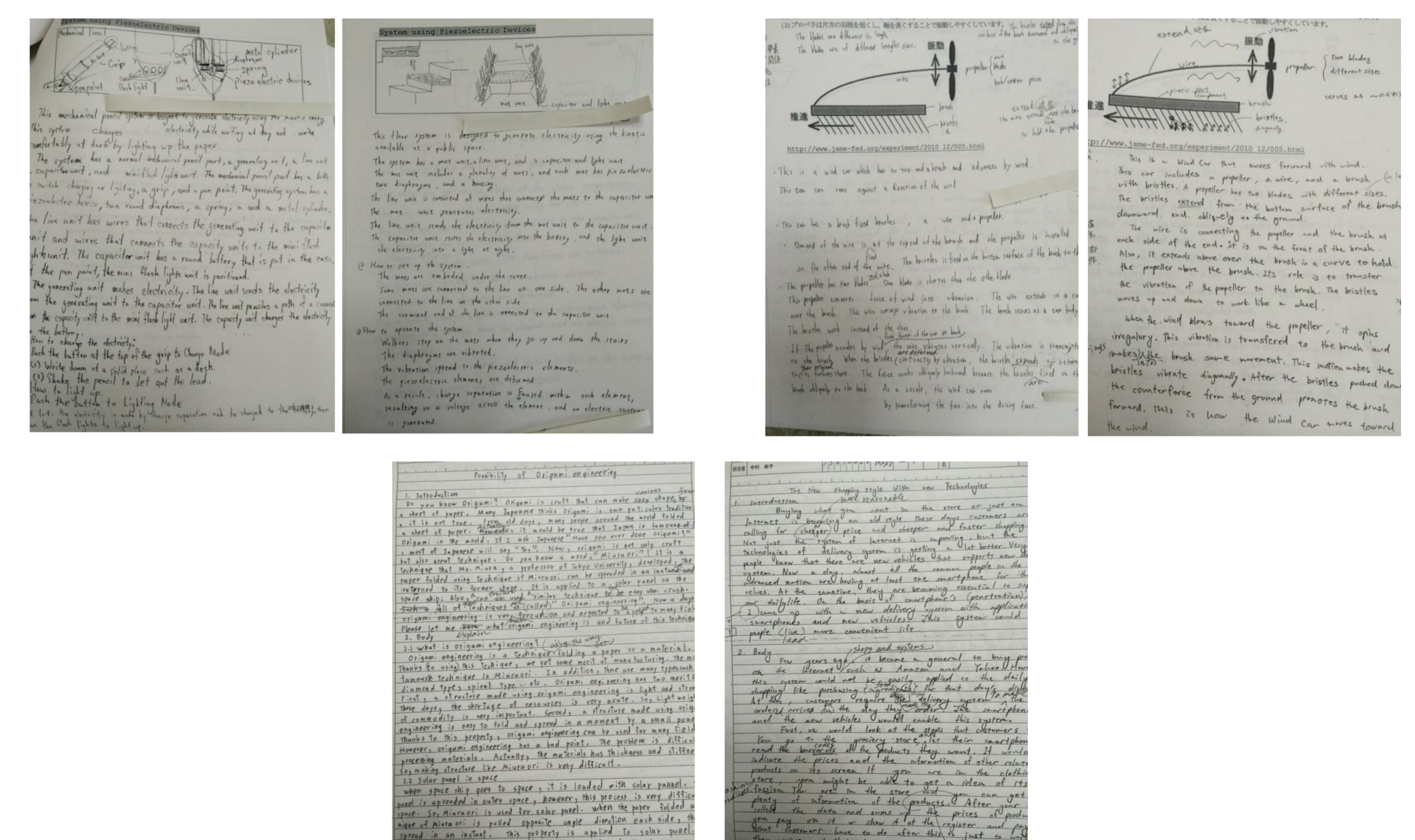
Process 2

= For enhancement

Examples of Topic Materials in Process 2

- fuel battery
- composition of fuel-gas mixture
- heavy ion cancer therapy
- damping tank
- multi-layer adhesive tape
- phases of titanium alloy
- bug affect on computer programs
- piezoelectric device
- traffic information service based on big data
- tether using mechanism to clear space debris
- face recognition technology
- automatic door without electricity

Examples of Student Works during Class



Conclusions

- As a result, students each achieve a higher level in their writing, because the approach
- ✓ is appropriate as a start to make students engaged in mastering English for science and engineering,
 - ✓ is fun and interesting for students, decreasing frustration in leaning English, and increasing motivation,
 - ✓ facilitates creating sentences more concise and clear than those translated from Japanese texts.

Through the input-output processes, students

- ✓ increase vocabulary and expressions, become confident in writing, and actively write on scientific topics,
- ✓ can focus on describing fact information and their findings more than studying English itself,
- ✓ understand that technologies can be written in groups of simple and short sentences.

For this approach, the author got a prize for popularity among students in 2013.

Future Work

- Teaching only in English may promote the English environment in this approach.
- This approach can be deployed for younger students.
- Teamwork with teachers will improves the curriculum.

References

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