

Improving Basic Numeracy Skills Among Primary Pupils in Southern Africa: Effectiveness of Calculation Card Materials

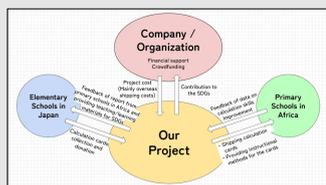
Osaka Prefectural Suito Kokusai High School

4 QUALITY EDUCATION



1. Purpose

Our project aims to improve basic numeracy skills among pupils in developing countries by developing effective ways to use calculation cards. Our goal is to build a localized reuse model of calculation cards in developing countries which also contributes to SDG4 Target 6, "By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy".



<Calculation cards reuse model>

2. Problem Awareness and Preliminary Research

(1) Problem Awareness

Recognizing that insufficient numeracy skills limits pupils' future potential and significantly hinder industrial development in developing countries, we considered how we, as high school students in Japan, could contribute to the issue.

(2) Preliminary Research

In Zambia, 97% of students have mathematics proficiency at Level 1 or below (Fig.1). However, basic numeracy skills can be significantly improved through practical exercises. ※2

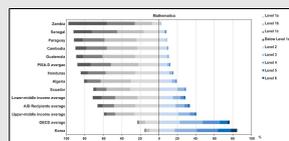


Fig.1 Mathematical Proficiency of Students in Each Country in PISA-D ※1

Based on the research, we concluded that the practical exercise by calculation cards may be effective for pupils in developing countries to improve their basic numeracy skills. We think that calculation cards have an advantage in developing countries since the cards will not be consumed by the exercises like drill worksheets.

3. Actions

(1) Survey on the Numeracy Skills of Primary School Pupils in Southern Africa and the Results Feedback

- Content: Addition and subtraction, 10 questions each, 20 minutes in total
- Target: 3rd, 4th, and 5th graders in Namibia, Kenya, Zambia
- Purpose: To provide reports to teachers in local schools. The report includes the rates of correct and wrong answers, and analysis of typical mistakes, in order to give suggestions on teaching methods to the local teachers.

(9) $60-6=66$ X
 <"[66-6] had the lowest correct answer rate, 11.6% in Namibia.">



<Pupils taking the survey in Namibia>



<Answer sheets from the survey in Namibia (left) and the grading process (right)>

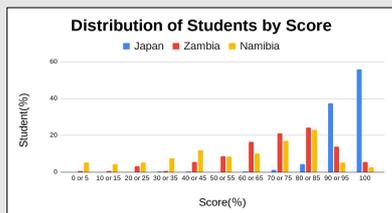


Fig.2 Distribution of Numeracy Skills Scores in Namibia, Zambia, and Japan



<Our Feedback report>



<Local teachers reading the report>

(2) The Effectiveness of Calculation Cards in Developing Countries

i) Collection of Calculation Cards from Schools in Japan

- Collected from:
- 3 elementary schools in Habikino City,
 - 3 elementary schools in Osaka City,
 - 26 other schools, organizations, and individuals.

Addition	298 sets
Subtraction	275 sets
Multiplication	324 sets
Total	897 sets

<Collected calculation cards>



<Receiving calculation cards from the Habikino City Board of Education>

ii) Assessment of the Effectiveness of Calculation Cards on Southern African Pupils

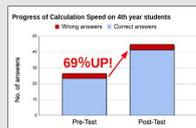
- Target: Pupils in Namibia and Zambia
- Duration: 1 month (about 20 school days)
- Pre-test before the cards practice and Post-test after.



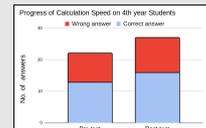
<Pupils using calculation cards at Ubasen Primary School>

We also made a manual to clarify the pupils and teachers the effective way of using the cards.

Fig.3 The Improvement on the Pupils on Calculation speed in Namibia



(a) Addition cards



(b) Subtraction cards



<A manual that shows pupils and teachers the effective way to use cards>

As a result, in Namibia, 95% of the pupils showed improvement in addition (a). However, in subtraction (b), they did not show significant improvement, which suggests that the pupils may have not acquired a numerical concepts yet.

iii) Development of Our Own Localized Cards

We have been developing our own localized cards that allows pupils to acquire a numerical concepts. We have started to contact some companies in Japan for the estimate of the manufacture of the cards.



<Localized cards sample>

iv) Establishing a Calculation Cards Reuse Model

a) Crowdfunding Projects for the Shipping Cost of the Cards

- We have successfully completed the crowdfunding projects on CAMPFIRE:
- Sep. 2024 - Nov. 2024 (¥62,500)
 - Aug. 2025 - Nov. 2025 (¥83,500)



<Our crowdfunding project completed in 2025>

b) PR of Our Project

(b-1) Our Website

The introduction of our project and the current updates are available on our website:



<Overview of our website>



<2D code for our website>

(b-2) External Contests, Presentations, Workshops, etc.



(3) Future Plans

To develop a reuse model of calculation cards in developing countries, we will carry out the following activities:

- Further assessment of the effectiveness of the calculation cards on southern African pupils.
- Cooperation with companies and schools, and collecting funds.
- Offering feedbacks on the results and updates of our project to the schools in Japan that contributed to our project, and building relationships to collect more calculation cards.
- Development and production of our own localized cards that help pupils to acquire a numerical concepts, and conducting trials using them.

4. References

※1 Republic of Zambia Ministry of General Education(2018).Zambia PISA-D National Report. p.29
 ※2 権守運. (2015). 「ガーナ共和国小学生の基礎計算能力向上のための教材開発」. 『第65回日本理科教育学会全国大会論文集』.p.137