

# EDU-Port Final Report

Kumon Institute of Education Co. Ltd.  
Nagoya University

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## ■ About this report

This is a project report on the "Improving Non-cognitive Skills of Industrial Workers through Habitual Mathematics Learning and Measuring its Effectiveness" project (project operator: Kumon Institute of Education(hereafter KUMON)), which was selected for the "Research Projects on Overseas Expansion of Japanese-style Education in the Post-COVID-19 Pandemic in FY2023" component of the research and study for promoting Japanese-style education amidst the COVID-19 pandemic (EDU-Port Nippon) launched by the Ministry of Education, Culture, Sports, Science, and Technology in Japan.

### 1. Project objectives

The purpose of this project was to introduce the Kumon Method of Learning\* in the industrial labor setting and measure its effects on workers' non-cognitive and cognitive skills, as well as on their productivity. To carry out this objective, KUMON worked on this project in collaboration with the Nagoya University SKY Project (Representative: Professor Shoko Yamada, Graduate School of International Development, Nagoya University).

The Nagoya University SKY Project has developed tools to measure the gaps between workers' actual skills and their employers' expectations, and it has the know-how to conduct such skills assessments in Africa. Therefore, it was decided to combine the Nagoya University SKY Project's expertise in skills assessment with the Kumon Institute of Education's learning materials and instructional methods to conduct this project in South Africa.

Both parties had a common motivation for this study: It was to examine whether young people who have finished attending school, a place for explicit learning, and are now working can improve their academic ability in mathematics and logical thinking (cognitive skills), as well as their discipline, self-affirmation, and ability to devise solutions to problems (non-cognitive skills) by developing the habit of learning mathematics, and to make suggestions for future industrial human resource development.

#### \*Kumon Method of Learning

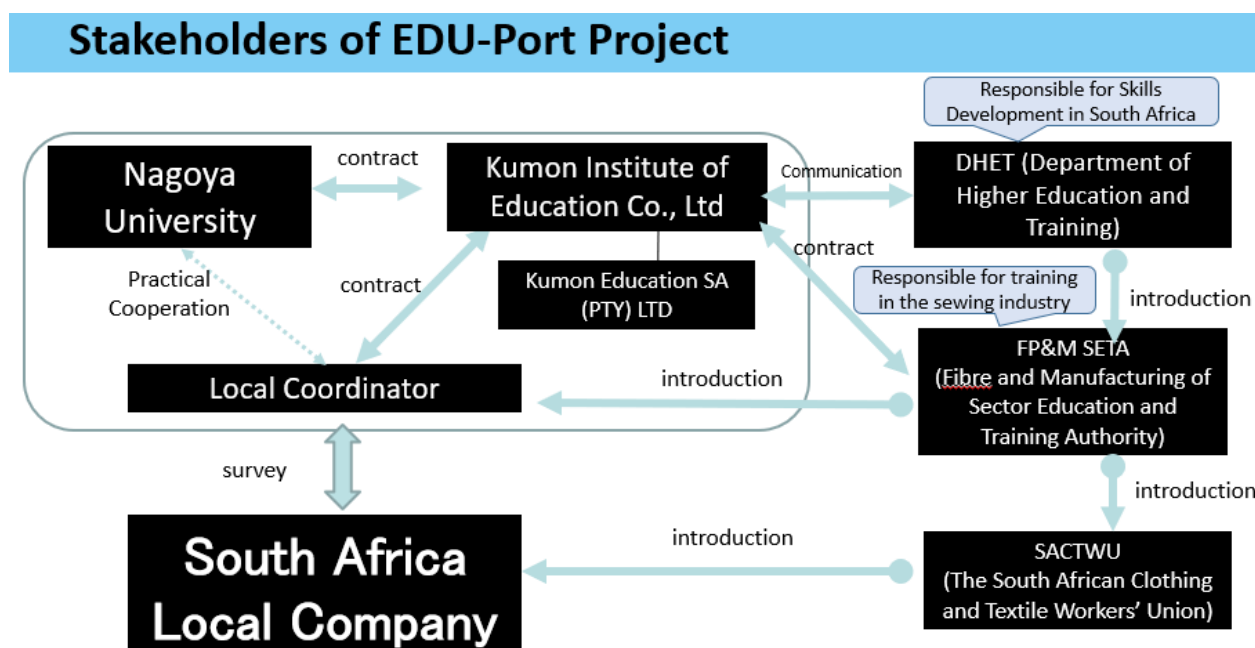
The Kumon Method of Learning is an individualized self-learning program tailored to each student's abilities. Students work through materials in small steps (e.g., the math program has more than 4,000 worksheets that advance from number counting to the high school math level, increasing the difficulty little by little) to improve their academic ability as well as non-cognitive skills, such as confidence, perseverance, and the ability to learn on their own. As of June 2024, more than three million learners were learning using this method in 63 countries and regions around the world. At Kumon Centers, instructors who have received necessary training in the Kumon Method provide instruction and support to their learners.

## 2. Project outline

### 2-1 Project structure (parties involved)

The project was implemented after securing the approval and cooperation of all parties concerned, including the South African Department of Higher Education and Training, which is responsible for the development of South Africa's industrial labor resources; the Fibre Processing and Manufacturing Sector Education and Training Authority (FP&M SETA), which is responsible for human resource development training in the garment industry under the Department's umbrella; and the South African Clothing and Textile Workers Union(SACTWU).

As for the promotion structure, a joint research agreement was concluded on the Japanese side between KUMON and Nagoya University to design the survey. In addition, a local coordinator was hired and assigned responsibility for the practical work (implementation of assessments and support for Kumon learning) in South Africa.

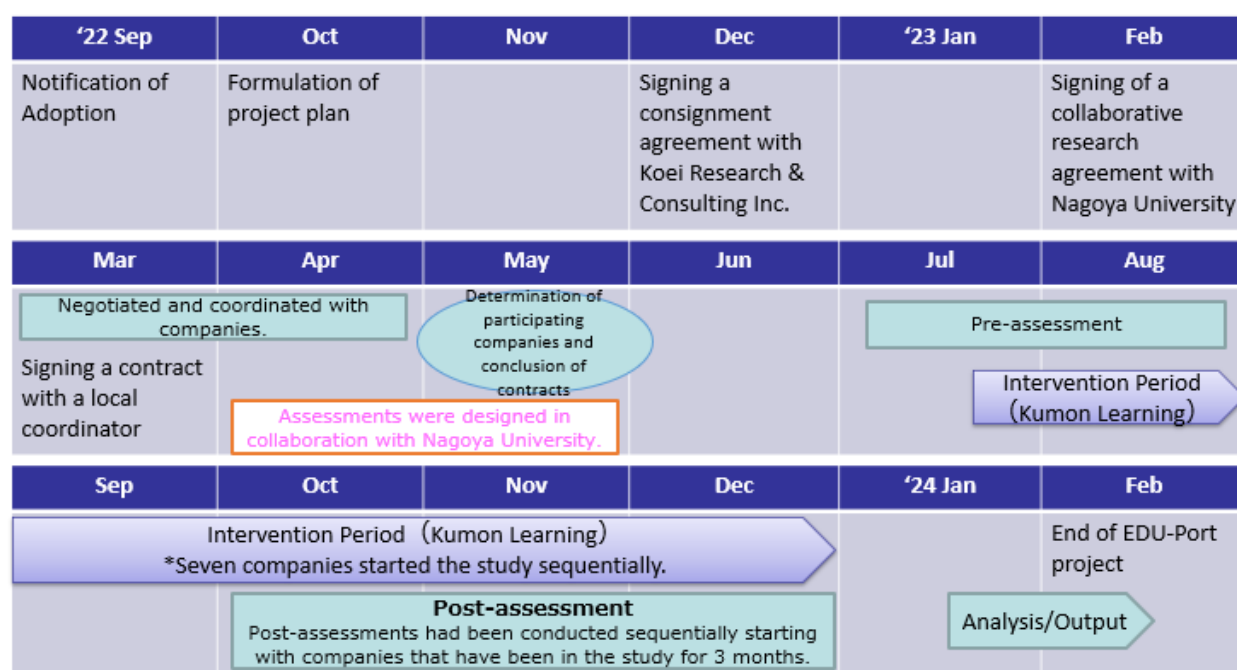


### 2-2 Project schedule

The overall project schedule was as follows.

From January to March 2023, preparations were made for the establishment of the above structure, and from April to June 2023, the selection of companies, conclusion of contracts, determination of participants, and various other procedures were conducted. During this period, we also worked on the design of the project assessment (questions from KUMON were added to the standard questions for the SKY Project). Then, starting in July 2023, among the participants of the seven participating companies, we sequentially conducted the pre-assessment, the Kumon study by the intervention group (three months), and the post-assessment.

## Schedule



### 2-3 Participating companies, number of participants from each company, and study setting

The number of participants from each of the seven participating companies is shown below. The frequency and timing of the study were determined according to the situation of each company. In short, participants were asked to undergo Kumon learning for 10–15 minutes during their lunch hours on workdays. However, the frequency of learning was limited to the scope of the basic agreement on the learning structure, and the actual situations varied depending on company vacations, employee shift conditions, and other factors. Details are provided below.

In this project, the participants studied Kumon in tablet format, which was released in January 2023. During the intervention period, the tablet devices were rented to the participating companies for the studies.

company	A	B	C	D	E	F	G	Sum
control group	7	22	29	5	10	8	23	104
intervention group	6	27	30	8	10	10	32	123
Frequency of study	3-4 per week	3-4 per week	every other day	3-4 per week	3-4 per week	3-4 per week	3-4 per week	
Timing of study	1)before work,2)lunch time	lunch time	lunch time	lunch time	lunch time	lunch time	lunch time	
Study start	Sep. 5th	Jul. 22nd	Jul. 19th	Aug.29th	Aug.22nd	Aug. 8th	Aug.16th	
Study end	Dec. 8th	Oct.27th	Oct.26th	Dec. 1st	Jan.26th	Nov.10th	Nov.24th	

\*For Company E, the period was extended until January because the study could not be conducted in November and December. Even so, there was almost no participation in the program, so it is removed from the analysis from this point forward.

## **2-4 Measurement of effectiveness**

To evaluate the learning effectiveness of the Kumon Method, we decided to utilize the skill evaluation module of the Nagoya University SKY Project and KUMON's Diagnostic Test to measure effectiveness in the following three ways:

- ① The same Diagnostic Tests administered to the intervention group before the study would be administered again after the study to compare the results.
- ② Pre- and post-assessments were conducted for both the control and intervention groups using the Nagoya University SKY Project's skills assessment module. Questionnaires were also administered to management and human resource personnel to gather data for analysis. (Since this assessment requires 2.5 to 3 hours, assessment participants were asked to come to the factory on a Saturday to conduct the assessment. The participants were paid 200 rand [about 1,400 Japanese yen] as an allowance.)
- ③ Interviews and questionnaires were conducted with the learners in the intervention group after the studies.

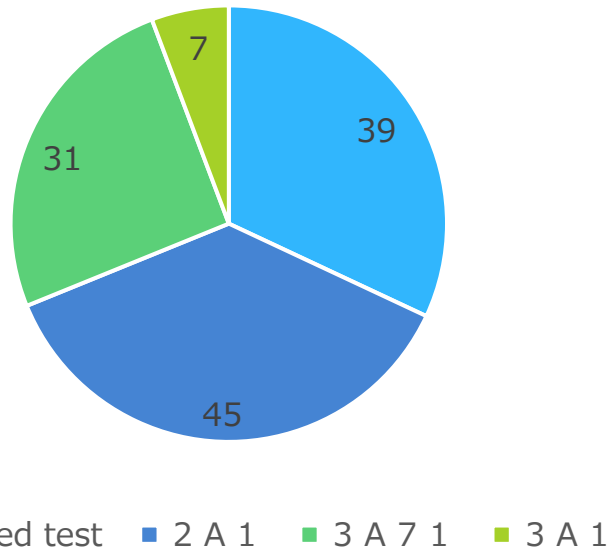
## **3. Status of the Kumon Method of Learning**

After completing the pre-assessment using the SKY Project modules, the participants started their Kumon studies on the start date set by each company. Prior to the start of the study, all of the intervention groups took the Diagnostic Test to determine their starting point. ("Starting point" refers to the worksheet level at which learners begin their Kumon studies based on the results of the Diagnostic Test. Kumon worksheets range from the infant level to a high school math level, and the level of worksheets with which the learner begins is determined based on their ability.) At all companies, a local coordinator visited the participants on the first day of their studies to explain the Kumon study procedures and provide support.

### **① Level of worksheets at the beginning of the study**

The starting point is individually determined according to the learner's ability level in Kumon learning. The following was the distribution of starting points determined after the intervention group took the Diagnostic Test.

Distribution of starting points for diagnostic test (P1)



Level 3A: Writing numbers up to 120, introduction to addition

Level 2A: Basics of addition (mental calculation)

Advanced test: The results suggest that the participant may take the Diagnostic Test for one level higher to decide their starting point. However, for this project, the starting point was set at 2A1, even for those who could take an advanced test.

## ② Number of study days and worksheets studied

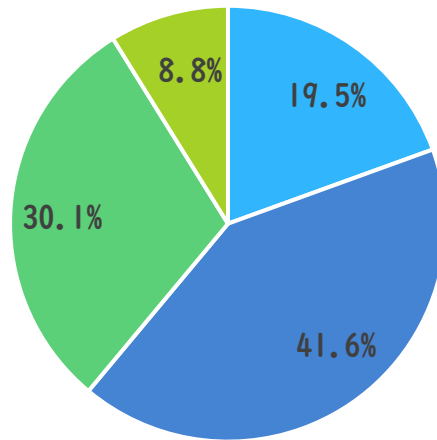
Since the Kumon Method posits that a habitual learning attitude positively influences non-cognitive skills, such as discipline, and cognitive skills, such as basic academic ability, it recommends that learners engage in a certain amount of learning every day to develop a learning habit. Therefore, in line with this characteristic of the Kumon Method, the number of study days and the number of worksheets studied were also checked in this project to confirm whether the students were regularly engaged in learning to develop the habit.

### Number of study days

The intervention period was set at three months for each company.

Assuming for convenience that the number of working days during a three-month period is 20 days per month (five days per week x four weeks), 60 days were available for learning during the three-month intervention period. Although the actual number of working days varied due to different shifts during the busy/off-peak periods and national holidays and vacations at each company, more than 60% of the total participants studied once every two days (for more than 30 days total) during the three-month project period. Additionally, about 20% of the learners studied almost every working day (for a total of 51 days or more).

### Number of study days

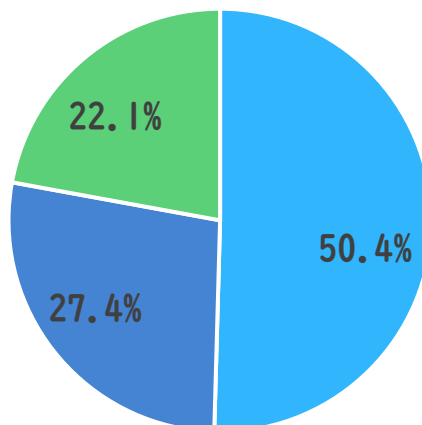


- 51 days or more
- 30~50 days
- 11~29 days
- 10 days or less

### Number of worksheets studied

here are 200 worksheets per level, as shown in the attached reference material (Table of Learning Materials). During the three-month intervention period, 77.8% of the participants studied at one level (200 sheets), and 50.4% studied at 2 levels (400 sheets).

### Number of study work sheets



- More than 400 work sheets
- 200~399 work sheets
- less than 199 work sheet

The status of each company is as follows.



company	A	B	C	D	F	G
# of study participants	6	27	30	8	10	32
More than 30 days	6	23	27	8	10	19
Less than 30 days	0	4	3	0	0	13
More than 200 work sheets	6	23	17	8	10	25
Less than 200 work sheets	0	4	13	0	0	7

\*Company C divided the study group into two groups, each holding a study date every other day, resulting in the varied numbers of worksheets studied.

### ③ Worksheet levels reached during the intervention period

In Kumon learning, as mentioned above, each individual has a different starting point. Therefore, even if they study the same number of worksheets, they may reach different levels in the same period. (For example, if a student starts at 3A1 and studies 200 sheets, they will reach 3A200, but if they start at 2A1 and study 200 sheets, they will reach 2A200.) The distribution of the worksheet levels reached from each starting point is shown below.

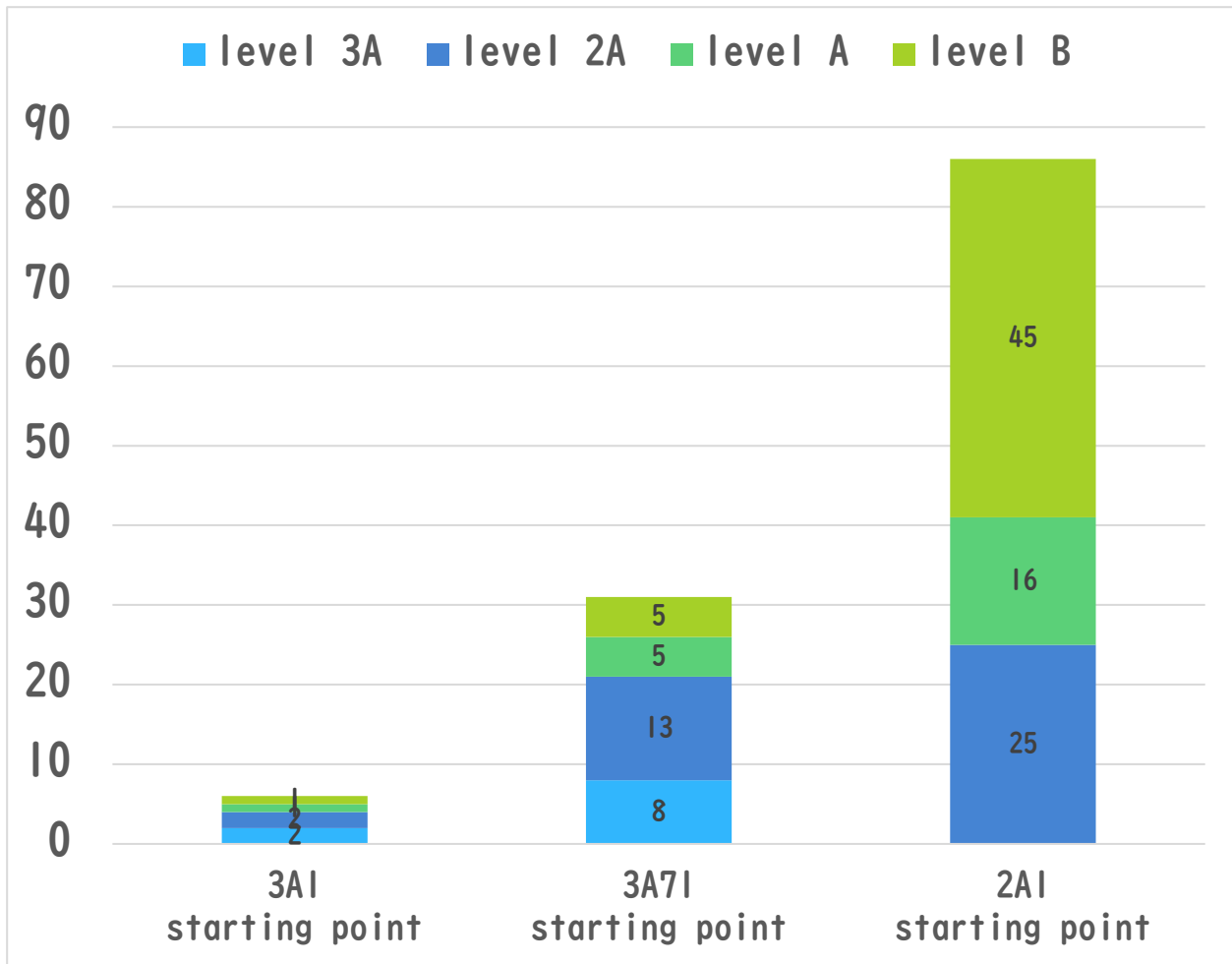
Among the learners in this intervention group, 70% of those who started at Level 2A reached Level A or B, but some learners who started at Level 3A or 2A also reached Level A or B.

Level 3A: Writing numbers up to 120, introduction to addition

Level 2A: Basic addition (mental calculation)

Level A: Addition and subtraction (mental calculation)

Level B: Addition and subtraction (vertical calculation)



#### ④ Retention rate

The study withdrawal rate (those who had no study record after the second month were considered as they had stopped learning) was less than 5%, i.e., five of the 113 participants.

#### 4. Measurement of learning effectiveness

The three methods described below were used to measure learning effectiveness.

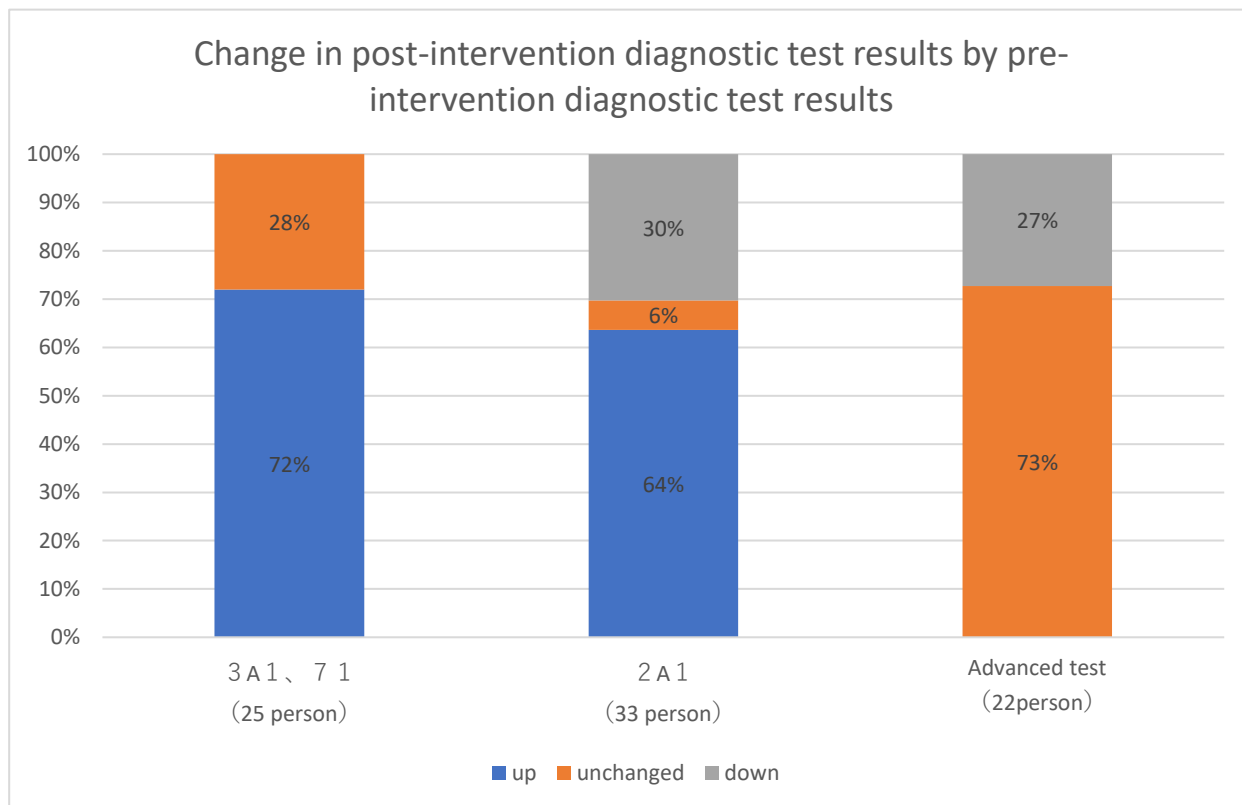
- ① The same Diagnostic Test administered to the intervention group before the study was administered again after the study, and the results were compared.
- ② Pre-assessment and post-assessment using the skills assessment module of the Nagoya University SKY Project were conducted for both the control and intervention groups. Questionnaires were also administered to managers and human resource personnel, and these data were integrated into the analysis.
- ③ Interviews and questionnaires were conducted with the learners after the learning intervention.

The results of each analysis are as follows.

##### ① Comparison of Diagnostic Test scores before and after the intervention

In the Diagnostic Test, the starting point is determined based on the time they take to complete the test and their number of correct answers. Comparing the results on the Diagnostic Test from before

and after the intervention, 67% of the group who began at a lower starting point before the intervention (those starting at Level 3A or 2A) raised their starting point (as determined by the test result) after the learning intervention. This means that 67% of the participants in the group who began at lower starting points before the intervention became able to solve math problems with a higher percentage of correct answers within the time limit.



## ② Suggestions from the Nagoya University SKY Project

Due to missing data and other factors, the Nagoya University's skills assessment module was not able to secure a sufficient sample size to withstand statistical analysis this time, and there were also a few areas in which respondents did not seem to be sincere in their responses. Therefore, it was not possible to capture consistent trends in terms of whether the effects of Kumon learning ultimately led to improved cognitive and practical skills on the job, or whether there were common attitudes and attributes among those who expressed enthusiasm about learning the Kumon Method. Therefore, the present data alone do not allow us to present the results of the regression analysis as numerical values, but the following points can be highlighted as moderate trends:

1. Those with higher Diagnostic Test scores after the intervention also tended to have higher pre-intervention Diagnostic Test scores (i.e., those with higher scores at the start of Kumon learning also had higher scores at the end of the learning).
2. A questionnaire was administered as part of the skills assessment conducted by Nagoya University before and after the Kumon study, which included questions from KUMON, which primarily concerned the ability to self-manage work processes. Among the participants, those with higher Diagnostic Test scores after the learning tended to exhibit stronger correlations with the

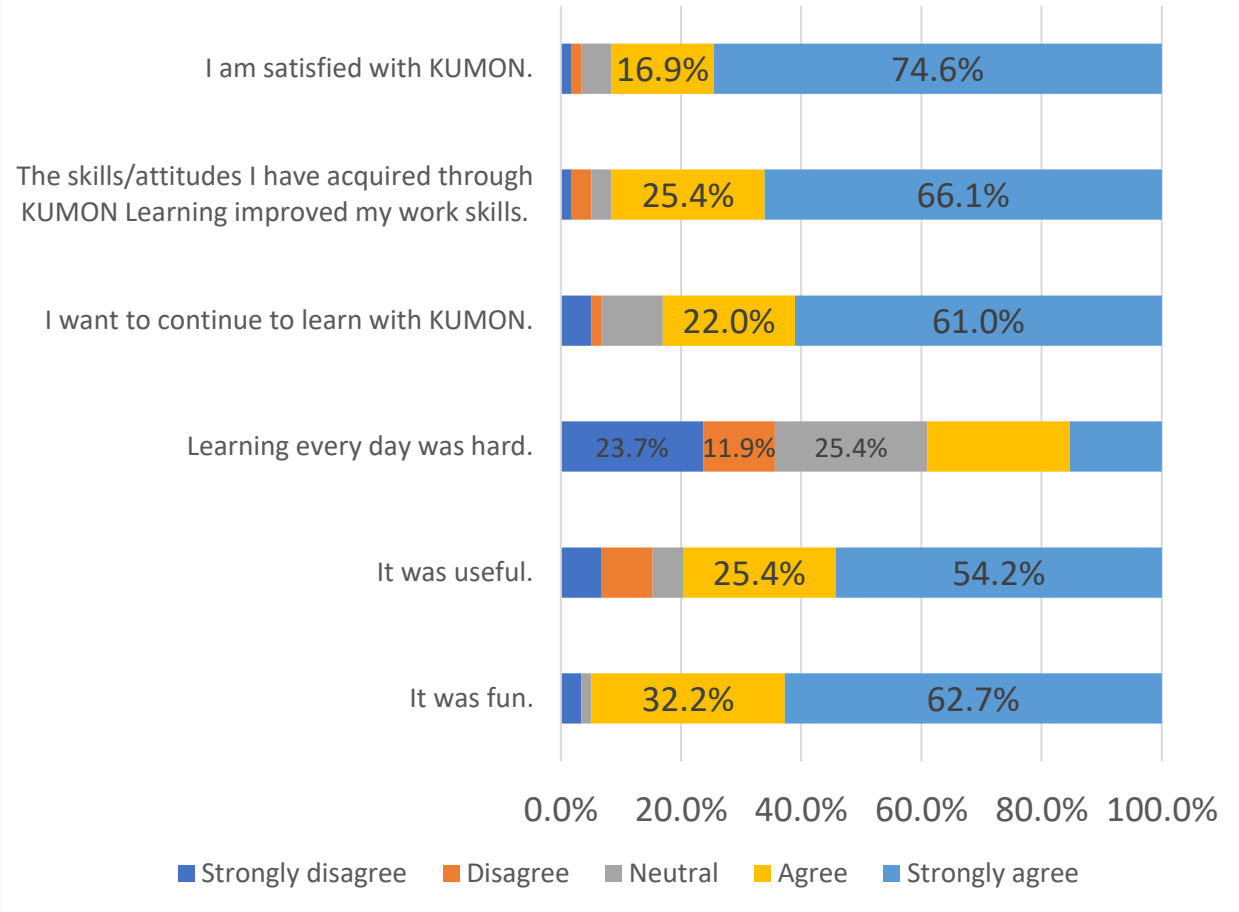
variable (the non-cognitive skill to self-manage) synthesized from the questions posed by KUMON. In other words, there seems to be a certain relationship between participation in Kumon learning and the ability to self-manage.

3. It appears that those with higher Diagnostic Test scores after the intervention were also those with higher grit, defined as the desire to accomplish goals without giving up. Grit was identified based on the items of the evaluation scale introduced to capture non-cognitive skills and the personality tendencies measured in the Nagoya University skills assessment.
4. Taking the 2 and 3 above together, it can be said that from the viewpoint of non-cognitive skill, it can be said that the Kumon Method is strongly associated with self-management ability and a never-give-up attitude. However, it is not possible to determine from statistical correlations alone whether self-management ability and the never-give-up spirit grew as a result of Kumon learning or, conversely, whether those who originally had these qualities continued to study the Kumon Method without getting bored with it (i.e., the causal direction of the relationship was unclear).
5. Unfortunately, however, there was no correlation between the scores on the Diagnostic Test and the results of the cognitive skill tests conducted in the SKY Project. If the intervention was designed to improve the ability to process mathematical, textual, or other information, this could be considered a problem. However, the intervention was primarily designed to improve, through continuous Kumon learning, the non-cognitive skills of industrial workers, who are not explicitly required to have mathematical skills in their daily lives and jobs. In light of this, although a causal relationship cannot be identified, it can be said that the objective of the study was not misdirected, since a (loose) correlation with the kinds of non-cognitive skills expected by KUMON can be observed.

### ③ Surveys and interviews

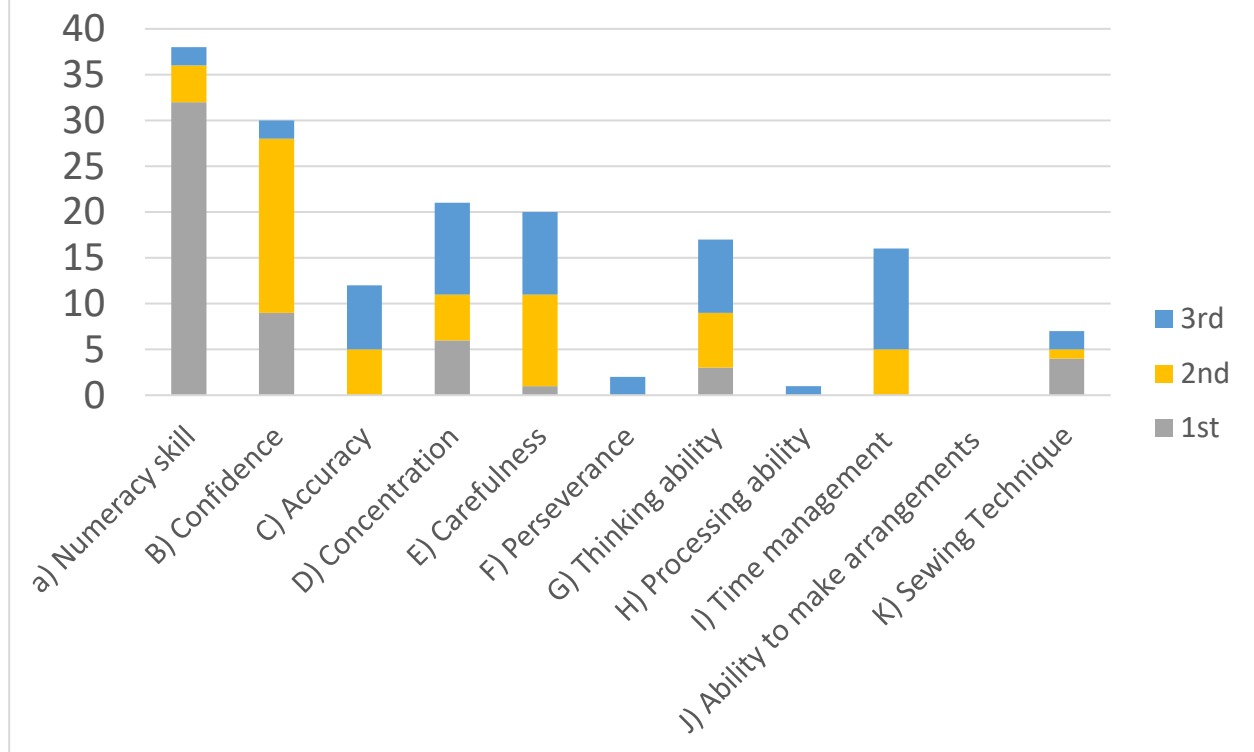
The results of the questionnaire showed that the project participants were generally positive about Kumon learning.

# Impressions/thoughts on Kumon Learning



When asked, "In order from the top, please tell us three abilities that you think have been particularly improved by Kumon learning," the most common responses were self-confidence, concentration, and attention skills, followed by numeracy skills.

## What skills have you acquired or improved through Kumon Learning?



Several managers and learners from the participating companies were interviewed. Below are some of their specific comments.

- I found that the employees enjoyed the project. The Kumon study required constant precision and concentration. We have the same expectation at the plant. We come to work every day, sit down, and do the same thing. It is easy to make mistakes because it is the same thing over and over again. So, being accurate all the time is important to this job. I think this program is good for improving concentration and accuracy. (Company A: manager)
- Kumon study was excellent because of its strong program. The workers seemed to gain confidence through the study. We would like to continue the program if possible. (Company G: manager)
- It was good to become familiar with numbers through the studies. We would like to have an English learning program. The fee is not expensive, even if it is R300 per person per month. (Company C: human resources staff)
- I think the learners, including myself, have learned to concentrate. This is an important skill in this job (sewing). As for other skills acquired, I think my number sense has improved because we did complex calculations in math. Since I deal with numbers in my work, I think the skills I acquired through the program have an impact on my work as well. (Company G: employee in charge of Kumon learning for their staff)

- Actually, my motivation was not high at first, with calculations like  $1 + 1$ ,  $1 + 2$ , and so on. But as I learned, I felt that it gave me not only the ability to calculate, but also the ability to concentrate, persevere, and solve problems. And I felt that I was actually gaining those skills, as well as skills in time management and how to deal with people.

Thinking before answering also improved my skills. I began to think before I spoke. This is just one example, but I found that I could apply the skills I gained from my learning to my work. I think this project enhances our skills, our minds, and our techniques. It provided me with a rewarding experience, and I was very excited about it.

I studied business administration in school but could not continue learning due to financial reasons. So, I am glad to have the training and hope to gain more skills and knowledge. (Company A: employee)

## **5. Proposals for the future**

### **Review and lessons from project management**

- Regarding Kumon learning at factories, this was the first case in which KUMON asked learners to work on their studies during working hours. Therefore, we were not sure of the extent to which the learners would study as frequently as expected, how long they would study, or how many worksheets they would study. Prior to the intervention, we thought there was a possibility that there would be some withdrawals during the project period, and that the frequency of studies and the number of worksheets would gradually decline. However, the frequency of studies and the number of sheets studied assuaged the initial concerns KUMON had (see p. 6, "3. Status of Kumon Method of Learning").
- Due to missing data and other factors, the Nagoya University's skills assessment module was not able to secure a sufficient sample size for statistical analysis this time, and there were also a few areas in which respondents did not seem to be sincere in their responses. This intervention left us with some challenges in terms of managing the implementation on the spot. In future opportunities, in terms of assessment operations, we will make sure to organize an environment that allows the participants to receive the assessment as regulated.
- Comments by the managers at the participating companies and the participants were generally positive, and as for specific effects, the actual withdrawal rate from the study (defined as those with no learning record after the second month) was less than 5%, or five out of the 113 participants. As for actual changes in the learners, their math academic ability (calculation ability) increased after three months of learning compared to when they started, and the learners themselves felt that not only their calculation ability but also their self-confidence and concentration had increased in terms of their own sense of effectiveness. Positive comments were also heard from the managers who oversaw the learning. This suggests that if we can create a style and environment that makes it easier for companies to apply the Kumon Method, there is a possibility that we can connect this method to services that contribute to the development of human resources at companies.

## **For the future**

- In this project, through collaboration between Nagoya University and KUMON, we believe that we were able to try the measurement of effects on cognitive skills, non-cognitive skills, and productivity by implementing assessments and solutions together.
- Nagoya University is developing a soft skills training program using gaming techniques, and KUMON is working on developing a service for companies that will use the Kumon Method for human resource development. This initiative has great significance from the perspective of enhancing the possibility of contributing to corporate human resource development by offering these programs, along with assessments, as techniques for developing specific skills.
- Although companies are interested in "how training affects productivity," it was difficult for them to provide us with data on productivity, and we were not able to clearly demonstrate cause-and-effect relationships.
- However, in a situation in which a diverse group of people with different abilities and skills were working in the same organization, the fact that the learning intervention group continued to make efforts and exhibit positive changes through this challenge suggests that "we can improve the development of industrial human resources by promoting the cycle of correctly understanding the current situation, identifying issues, and taking action to solve them."
- Both Nagoya University and KUMON will continue to work on developing our offerings, thereby improving the services offered to companies. We will maintain a relationship that allows us to exchange information and opinions regarding assessment and practices in the areas of vocational training and employment, and we will consider collaborating again in the future in the field of industrial human resource development.

## **Regarding KUMON's corporate services**

In the future, when KUMON considers offering the Kumon Method as a training service to companies (factories) like those targeted in this project, it can apply four lessons learned from this project:

### **1) Management should have a clear purpose for introducing the Kumon Method**

In terms of industrial human resource development, as companies are likely to face different challenges, such as the number of defective products, the frequency of accidents, the time required to make parts, and the willingness to work, it is essential to confirm their needs and consult each company individually to determine what the Kumon Method should be used for and what environment and conditions should be created to achieve the greatest outcomes.

### **2) The learners should be convinced of its purpose and significance (not only at the start but throughout the study period)**

Because they are adults, it is important to present the aims and objectives of the studies in a way that the learners can understand. Considering that they are learning while working, we may be able to stoke their motivation for learning by helping them recognize the effects (for instance, through the presence of Kumon coordinators and visualizations of their progress).



### **3) The timing, duration, goal setting, and standard packages should be determined with consideration of how busy the participants will be during the intervention**

Although the busy/quiet periods throughout the year vary from company to company, in EDU-Port, there were cases in which the frequency of studies could not be ensured during the quiet periods because of a drop in the frequency of shifts, and at the companies that engaged in pilot utilization of the Kumon Method after EDU-Port ended, there were cases in which the learners studied less when their main job became too busy. In light of these factors, it is important to carefully consider what should be regarded as successful outcomes, or when and how long we should work on the project, in addition to setting goals as mentioned in point 1 above.

### **4) Visualize results by issuing individual feedback sheets**

One of the most common requests from the companies and learners was for visualizations of their results. Rather than simply receiving the reports of the learning results, they wanted to be able to present the results externally, for instance, by issuing a certificate of program completion or linking to NQF levels, either to motivate employees or to use as a guide for improving their skills. If we want companies to implement the Kumon Method in staff training, we should motivate them to do so by linking and matching it with external indicators.

We will continue to explore ways to contribute to the development of industrial human resources through assessment and program provision while staying aware of the needs and challenges of companies.

#### **<References>**

- ① Table of Learning Materials (only the part studied by participants)

## TABLE OF LEARNING MATERIALS(Level 3A ~ B)

\*SCT=Standard Completion Time per sheet

	Level 3A		Level 2A		Level A		Level B	
	Contents	SCT	Contents	SCT	Contents	SCT	Contents	SCT
<b>1-10</b>	Numbers up to 120		<b>Review up to 3A</b>	<b>1~2</b>	<b>Review up to 2A</b>	<b>1~2</b>	Horizontal addition	1~2
11-20			Adding 4(UP to 12+4)	1~2	Addition(up to sum of 12)	1~2	Addition to 100	1~2
21-30			Adding 4(UP to 16+4)	1~2	Addition(up to sum of 15)	1~2	Addition to 100	2~3
31-40			Adding 5(UP to 12+5)	1~2	Addition(up to sum of 18)	1~2	Addition to 100	2~3
41-50			Adding 5(UP to 15+5)	1~2	Addition(up to sum of 20)	1~2	Addition of 2-digit numbers	2~3
51-60			Adding up to 5	1~2	Addition(up to sum of 24)	1~2	Addition of 2-digit numbers	2~3
61-70			Adding up to 5	1~2	Addition(up to sum of 28)	1~2	Addition of 3-digit numbers	2~3
<b>71-80</b>	<b>Adding 1(Up to 12+1)</b>	<b>1~2</b>	Adding 6(UP to 12+6)	1~2	Addition(Summary of Addition)	2~3	Addition of 3-digit numbers	2~4
81-90	Adding 1(Up to 18+1)	1~2	Adding 6(UP to 14+6)	1~2	Subtraction(Subtracting 1)	1~2	Addition of 3-digit numbers	2~4
91-100	Adding 1(Up to 24+1)	1~2	Adding 7(UP to 11+7)	1~2	Subtraction(Subtracting 2)	1~2	Addition of 3-digit numbers	3~5
101-110	Adding 1(Up to 30+1)	1~2	Adding 7(UP to 13+7)	1~2	Subtraction(Subtracting 3)	1~2	Subtraction(Review up to A)	1~2
111-120	Adding 1(Up to 60+1)	1~2	Adding up to 7	1~2	Subtraction(Subtracting up to 3)	1~2	Subtraction(Review up to A)	2~3
121-130	Adding 1(Up to 1000+1)	1~2	Adding up to 7	1~2	Subtraction(Subtracting up to 5)	1~2	Subtraction of 2-digit numbers	2~3
131-140	Adding 2(Up to 14+2)	1~2	Adding 8(UP to 11+8)	1~2	Subtraction(From numbers up to 10)	1~2	Subtraction of 2-digit numbers	2~3
141-150	Adding 2(Up to 18+2)	1~2	Adding 8(UP to 12+8)	1~2	Subtraction(From numbers up to 11)	1~2	Subtraction of 2-digit numbers	2~3
151-160	Adding 2(Up to 32+2)	1~2	Adding 9(UP to 12+9)	1~2	Subtraction(From numbers up to 12)	1~2	Addition and Subtraction of 2-digit numbers	2~4
161-170	Adding 3(Up to 14+3)	1~2	Adding 9&10(Up to 12+9 and 15+10)	1~2	Subtraction(From numbers up to 14)	1~2	Subtraction of 3- digit numbers	2~3
171-180	Adding(Up to 21+3)	1~2	Adding up to 10	1~2	Subtraction(From numbers up to 16)	1~2	Subtraction of 3- digit numbers	2~4
181-190	Adding Up to 3	1~2	Adding up to 10	1~2	Subtraction(From numbers up to 20)	1~2	Subtraction of 3- digit numbers	2~4
191-200	Adding up to 3	1~2	Adding up to 10	1~2	Subtraction(Summary of Subtraction)	2~3	Subtraction of 3- digit numbers	3~5

② Kumon Institute of Education website

<https://www.kumongroup.com/eng/index.html>

③ Nagoya University SKY Project website

[https://skills-for-development.com/home\\_en](https://skills-for-development.com/home_en)