

Implementation content : Determining reach and rubric extent of time series change pattern graph learning

Attainment target : Time series change pattern graphs can be created, and events can be explained along the time axis, including causes and reasons.

Rubric for a Behavior-over-time Graph

| | Change Variable (y-axis) | Time Boundary (x-axis) | Change Representation | Explanation of a Graph |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | <ul style="list-style-type: none"> Identifies one or more significant, specific quantitative (e.g. population) or qualitative (e.g. happiness) components that change over time in the system Identifies and descriptively labels an appropriate comparative change scale (e.g. glad, happy, ecstatic) | <ul style="list-style-type: none"> Identifies start and end time boundaries within which the variable changes and includes a boundary for projected change based on current trends Identifies content-appropriate time units (e.g. hours, years, chapters) Represents time units in a learner-appropriate manner (e.g. pictures) | <p>Represents continuous pattern of change/trend of a variable over time using a line on a graph in one or more of the following ways:</p> <ul style="list-style-type: none"> Visibly distinguishes on the line graph the projected pattern of change/trend from that which has occurred Uses referenced, separate lines on a graph to represent related trends | <p>Explains a variable's continuous pattern of change/trend over a specified period of time and does one or more of the following:</p> <ul style="list-style-type: none"> Explains a projected behavior based on current trends Explains the differences between changes in qualitative (e.g. happiness) vs. quantitative (e.g. population) variables that change over time Explains the difference between changes in accumulations over time and the rates at which they change |
| 3 | <ul style="list-style-type: none"> Identifies a significant, specific quantitative (e.g. population) or qualitative (e.g. happiness) component that changes over time in the system Identifies an appropriate comparative change scale (e.g. low, medium, high) | <ul style="list-style-type: none"> Identifies the time boundary within which the variable's change starts and ends Identifies content-appropriate time units (e.g. hours, years, chapters, etc.) | <p>Represents continuous pattern of change/trend of a variable over time using a line on a graph</p> | <p>Explains a variable's continuous pattern of change/trend over a specified period of time</p> |
| 2 | <ul style="list-style-type: none"> Identifies a general rather than specific component that changes over time in the system (e.g. feelings rather than happiness) Identifies an unclear comparative change scale that also may have labels representing multiple variables (e.g. sad, angry, happy) | <ul style="list-style-type: none"> Identifies a boundary that is too short or too long Identifies time units that do not match the time during which the variable has changed | <p>Represents continuous pattern of change/trend of a variable over time as event-based using dots connected by a line on a graph</p> | <p>Explains a variable's pattern of change/trend as a series of individual events that are connected in time</p> |
| 1 | <ul style="list-style-type: none"> Identifies a component that is an individual event rather than one that changes over time (e.g. changes clothes) Identifies a comparative change scale that does not encompass change of the component | <ul style="list-style-type: none"> Does not include a time boundary Does not include any units on the graph | <p>Represents continuous pattern of change of a variable over time as event-based using unconnected dots on a graph</p> | <p>Explains a variable's change as a series of individual events that are not connected in time and/or that are not related to the variable</p> |

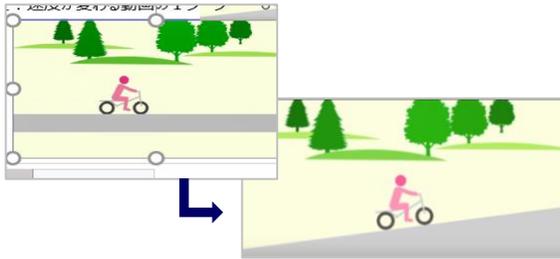
The goal for the lessons

Implementation content : Assessment and development of teaching materials

[Development of digital teaching materials and analog teaching materials]

■ Digital teaching materials (Case)

View and graph the image of the bicycle advancing at different speeds.

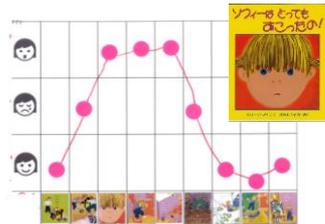


After drawing the graph, discuss what changed in the time series and why it changed and deepen your understanding of the graph.

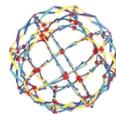
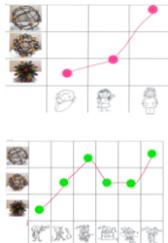
13 digital teaching materials developed

■ Analog teaching materials (Case)

Sophie's feelings are graphed using the picture book "When Sophie Gets Angry."



Graph the growth of a child and the day in the garden using the teaching tool "Hobermann Ball" that can be changed in size.



11 analog teaching materials developed (Including trial production)

[Assessment development]

Implementation method

An interview method with the lecturer one by one.

Time required

About 5 minutes (Pre-assessment is slightly longer because you want to get used to it)

Flow

1. Description

After seeing the changes in the four pictures in the video, I received the question "What is changing?" And explained while looking at the pictures.



2. Temperature change

4 wooden pictures are indicated likewise, and the question to which I say "Which clothes are chosen at the same time?" is received and something suitable is chosen from 3 kinds of clothes.



3. Graph creation

4 wooden pictures and the vertical axis are hot likewise in a transverse it's usually cold, but the place where I come during an indicated seat is chosen and a sticker is stuck.



Implementation content : Program contents implemented at 2 gardens

[Showa Women's University Showa Preschool]

| Program contents | | |
|------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1st | Pre-assessment | Explain the changes in the four trees, and compare the clothes and experiences (hot and cold) with the four trees. |
| 2nd | Lesson1 | Read the picture book "Muncha! Muncha! Muncha!" and show the character's feelings on a graph. |
| 3rd | Lesson 2 | After observing the change of the trees in the four seasons, arrange the photographs of the change of the tree on the horizontal axis, place the amount of leaves on the vertical axis, graph it, and then convert the vertical axis to clothes and graph. |
| 4th | Lesson 3 | Teaching tool Hoberman Sphere combination and story (two types) and make a graph. |
| 5th | Lesson 4 | Read the picture book "The Rainbow Fish" and show the character's feelings on the graph. |
| 6th | Lesson 5 | Read the picture book "When Sophie Gets Angry" and display the character's feelings on a graph. |
| 7th | Lesson 6 | Read the picture book "Giraffes Can't Dance" and show the character's feelings on a graph. |
| 8th | After-assessment | Explain the change of the four trees, and compare the clothes and the feeling (hot and cold) with the four trees. |

[Kindergarten & Childcare First Classroom SETAGAYA]

| Program contents | | |
|------------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1st | Pre-assessment | Explain the changes in the four trees, and compare the clothes and experiences (hot and cold) with the four trees. |
| 2nd | Lesson1 | Look at the image where the flowers bloom in order, think about the order, and graph it. Next, notice that it may decrease by looking at the image of the donut, graph it. |
| 3rd | Lesson 2 | After observing the change of the four seasons in the image, arrange the photographs of the change of the tree on the horizontal axis, place the amount of leaves on the vertical axis, graph it, and then convert the vertical axis to clothes and graph. |
| 4th | Lesson 3 | Graph on the theme of decreasing and increasing. Look at the picture of the pizza and see how it diminishes, then graph the number of people eaten for each person. Look at the image of the jigsaw puzzle, put the number of pieces on the horizontal axis, put the shape of the puzzle on the vertical axis, and graph it. |
| 5th | Lesson 4 | After looking at the image of the bird's nest, and thinking about what the image is, use a graph to indicate in what scene the bird's nest was found. Look at the picture of the tree and notice that people are doing something under the tree or under the tree. |
| 6th | Lesson 5 | Look at the image of the bicycle, notice the difference in speed and the difference in the road, and use graphs to express the speed of each scene. Discuss the reasons for getting faster and slower. Walk fast or walk late. |
| 7th | Lesson 6 | Read the picture book "Kirin wa dare no dance" and show the character's feelings on a graph. |
| 8th | After-assessment | Explain the change of the four trees, and compare the clothes and the feeling (hot and cold) with the four trees. |

Implementation content : State of lesson

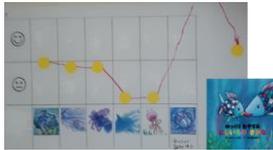
【Lesson at Showa Women's University Showa Preschool】



State of the first
The first graph
gathers together



State of the third
I also watched the graph
I made and practiced it
in front of everyone



4th graph(Entry
example) In the story,
the last sticker of the
graph was put on the
back of the sheet
because the hero
was very relieved at
the end



State of the fifth
Finally, I explained
one by one to the
teacher while looking
at the graph that was
made. This form has
settled down most

【Kindergarten & Childcare First Classroom SETAGAYA Lessons using digital animation teaching materials】

The first video teaching
material



For the first time, I'm
interested in the movement
of my fellows



Right: 1st graph
Bottom: Create a
fun second graph



【Implementation of a program tailored to the situation of children】

At Showa Women's University Showa Preschool, we often saw how teachers taught each other. Since the time became long on the way, in the second half we changed the alignment and reviewed the configuration. The speed of the child's growth was fast, and I tried to reflect on each lesson and always prepare a program tailored to the current area of learning.

〔Lesson1〕

①Graph creation, asked and explained



②I also care about the
movement of the other side



③Talk here



④Point and explain



〔Lesson5〕

①Graph making while listening to the story
side by side (5'35")



②By the end of the 15'40", I felt a little tired,
but to hear a little opinion



③Last explained to the
teacher one by
one(16'30")



Implementation content : Determination of assessment criteria

- The three assessment items were conducted with the following goals, and scored using the evaluation criteria.
- The second temperature change was intended to be shown by the choice of clothes, but the relationship between the seasons and clothes has become fluid recently, and it was decided not to put a weight as an evaluation item. As a result, climate change played a role in linking items 1 and 3.

| Assessment item | Aim | Evaluation criteria |
|------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Graph explanation | How can we explain the changes in the paintings of the four trees | <ul style="list-style-type: none"> • 3 full marks • Criteria (Refer to the evaluation criteria of the explanation of the graph in the table) <ul style="list-style-type: none"> 3 points : Touching the relationship between time series, cause and effect 2 points : I can compare 1 points : I can say the viewpoint |
| 2. Temperature change | Can the temperature change be expressed by the choice of clothes | <ul style="list-style-type: none"> • 4点満点 • 4枚の木の絵(=季節)について、1枚できれば1点とした |
| 3. Graph understanding | Can you put a seal in the appropriate position of the X-ray Y-axis | <ul style="list-style-type: none"> • 4点満点 • 4枚の木の絵(=季節)について、1枚できれば1点とした |

1. Evaluation criteria of graph explanation (detail)

| Score | Explanation of graph | Evaluation criteria for explanation |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 points | <ul style="list-style-type: none"> • It can explain how variables change with the passage of time. | <p>Time series (conjunction) Example: First, return to winter again, gradually, become ○○, become ○○, and connect with the season</p> <p>Cause and effect He touches on the relationship between cause and effect.</p> |
| 2 points | <ul style="list-style-type: none"> • You can understand that variables change and you can explain individual things in connection with the passage of time. | <p>Comparison Example: This is ○○ This is ○○</p> |
| 1 points | <ul style="list-style-type: none"> • While it is possible to explain the change of variables in connection with individual matters, it is not possible to explain the relationship with the passage of time. | <p>point of view Four seasons (winter, spring, summer, autumn) Temperature (hot,cold) State of tree (snow, flower, fruit, fallen leaves) Ground (snow, green, fallen leaves) Ground color (white, green, red) Other (eg sky)</p> |

2. Evaluation criteria for understanding graphs (details)

| Understanding the graph | Evaluation criteria for understanding |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • You can use a line to represent variables as they change over time. | <ul style="list-style-type: none"> • It is not evaluated in the assessment. • During the lesson, I saw a child who used a hand to draw a graph when explaining. |
| <ul style="list-style-type: none"> • For variables that change over time, events can be graphed on points and connected by lines. | <ul style="list-style-type: none"> • By putting the points correctly, it is considered that they can be connected by a line. |
| <ul style="list-style-type: none"> • Events can be graphically represented as points for variables that change over time. (Cannot be represented by a line) | <ul style="list-style-type: none"> • Since there are four forms (seasons) of trees, four points were actually scored, and if it could all be scored as four points. |

Implementation content : Comparison of pre-assessment and After-assessment results

1. Graph explanation

Pre-assessment : Explain the changes in the four trees, and compare the clothes and experiences (hot and cold) with the four trees.

After-assessment : Explain the change of the four trees, and compare the clothes and the feeling (hot and cold) with the four trees.



Seasonal picture used for assessment (4 sheets)

| NO | Result | | Pre | After |
|------|--------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Pre | After | | |
| S001 | 1 | 3 | <ul style="list-style-type: none"> • There is a fruit. • That has changed a bit. | <ul style="list-style-type: none"> • Although it snowed in winter, flowers bloom in spring, so is it summer? It's not a flower in summer, what is this? ? Is it a mikan like mikan? The mikan is in bloom and leaves in autumn. |
| S002 | 1 | 3 | <ul style="list-style-type: none"> • Season. • It is cold, hot, or unusual. | <ul style="list-style-type: none"> • Season. • Is it cold or warm • It changed in winter, spring, summer and autumn. |
| S007 | 2 | 3 | <ul style="list-style-type: none"> • From now on, this. • It changed to this from now on. • leaf. • There is more grass here than here. • Only here is not fruitful. • The color of the sky is different only here. • Umm...do not know. | <ul style="list-style-type: none"> • At first, it was snowing, and then it was completely white, but it gradually became blooming and the flowers became beautiful, and it became yellowish, so it turned like this reddish yellowish green, so red and yellowish Became. |
| S009 | 1 | 3 | <ul style="list-style-type: none"> • It's snowing, so the flowers are in bloom, the fruits are in bloom, the leaves are falling. | <ul style="list-style-type: none"> • At first it was snowing like this and it wasn't quite like this, but in spring it was full of petals and the petals and flowers were falling. Well, this is full of such fruits, it's kind of autumnal, and it has yellow leaves, some yellow ones and some orange ones. |
| F001 | 1 | 3 | <ul style="list-style-type: none"> • What is attached to this tree first has changed. | <ul style="list-style-type: none"> • Season. • It became snow, cherry blossoms, rose, red and yellow leaves. |
| F002 | 1 | 3 | <ul style="list-style-type: none"> • The fruits came, the fruits were gone, and the leaves fell. | <ul style="list-style-type: none"> • Season. • It was snowing, the snow was melting, the flowers were blooming, the flowers were scattered, the fruits were growing, and then the leaves were turned. |
| F003 | 1 | 3 | <ul style="list-style-type: none"> • It's snowing, so it's snowing, so flowers don't bloom, and when it's spring time ... that's ... well ... there are more here, but it's less when the petals fall. • So when it comes to autumn | <ul style="list-style-type: none"> • This is the first winter, the next is spring, summer and autumn, so there is no leaf in winter, but in spring there are more leaves and flowers are blooming, and in summer the flowers are fruitful. So the leaves fall in the fall. |
| F004 | 1 | 3 | <ul style="list-style-type: none"> • This is spring, this is snow, this is summer, this is autumn. | <ul style="list-style-type: none"> • It's winter, it's spring, it's summer, it's autumn. • The leaves change in winter, there are leaves and flowers in spring, there are apples and leaves in summer, and no leaves in autumn. |

Implementation content : Comparison of pre-assessment and After-assessment results(Cont)

2. Temperature change

| S001 | | S002 | |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Pre | After | Pre | After |
|  |  |  |  |
| S003 | | S004 | |
| Pre | After | Pre | After |
|  |  |  |  |
| S006 | | S007 | |
| Pre | After | Pre | After |
|  |  |  |  |

Implementation content : Comparison of pre-assessment and After-assessment results(Cont)

3.Graph understanding

| S001 | | S002 | |
|------|-------|------|-------|
| Pre | After | Pre | After |
| | | | |
| S003 | | S004 | |
| Pre | After | Pre | After |
| | | | |
| | | | |
| S006 | | S007 | |
| Pre | After | Pre | After |
| | | | |
| | | | |

Achievements: Overview

The state you want to achieve

1. A state in which it is recognized that a child who has taken the "system thinking" learning material for developed preschool children has used the material and has taken the first step of the system thinker's habit.
2. It is a condition that the child after the class receives a reaction equivalent to the preschool children of advanced foreign cases.
3. It is in a state where it is interested in the teaching materials it has taken as ICT teaching materials, and habituation begins by working independently.
4. The above states can be presented as quantitatively as possible by rubric evaluation and the like.

Goal "Can create time-series change pattern graph, and can explain events along the time axis, including causes and reasons"

Achievement target of this demonstration project

| | |
|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Represents continuous pattern of change/trend of a variable over time using a line on a graph | Explains a variable's continuous pattern of change/trend over a specified period of time |
| Represents continuous pattern of change/trend of a variable over time as event-based using dots connected by a line on a graph | Explains a variable's pattern of change/trend as a series of individual events that are connected in time |
| Represents continuous pattern of change of a variable over time as event-based using unconnected dots on a graph | Explains a variable's change as a series of individual events that are not connected in time and/or that are not related to the variable |

Actual achievement level

- Although it is difficult to measure changes in noncognitive ability in a short period of time and quantitatively measure the retention of system thinking, it makes it a habit to graph, which is one element of system thinking that is the goal to be achieved this time. I think that the purpose was achieved because the tendency was seen in most children about that it was made to let.
- It is considered that most children after the end of the lesson have received a reaction equivalent to that of the pre-school children in advanced foreign countries.
- There was a debate as to whether preschool was appropriate as a time to start system thinking and learning, but from this result it was possible to support that it is better to start in early childhood.
- There is a research result that children's brain grows up most at the age of 4 to 5 years, and we conducted a field experiment of system thinking learning for preschool children for the first time in Japan regarding the possibility of performing system thinking learning at this time. The significance is great.

Reason, improvement/Direction of development

- System thinking education is complex and requires experimentation. Next examination of the hypotheses emerging from here will lead to the development of future system thinking education.
 - Since the number of subjects is small and the scientific basis and data are lacking in this analysis of results, continuous verification is necessary.
 - In this case, the child chooses a method of putting a sticker and expressing it, but other methods such as drawing a graph with a hand and expressing it with a body, etc., are also considered. It is desirable to try various possibilities.
 - System thinking is holistic, and it is important to take a systematic approach under various circumstances, so it is also meaningful to study system thinking in, for example, play and exploration activities.
- In this demonstration experiment, because digital teaching materials and analog teaching materials were used in different gardens, it was difficult to mention comparative evaluation of teaching materials. It is also necessary to continue the search for the possibility of developing teaching materials.

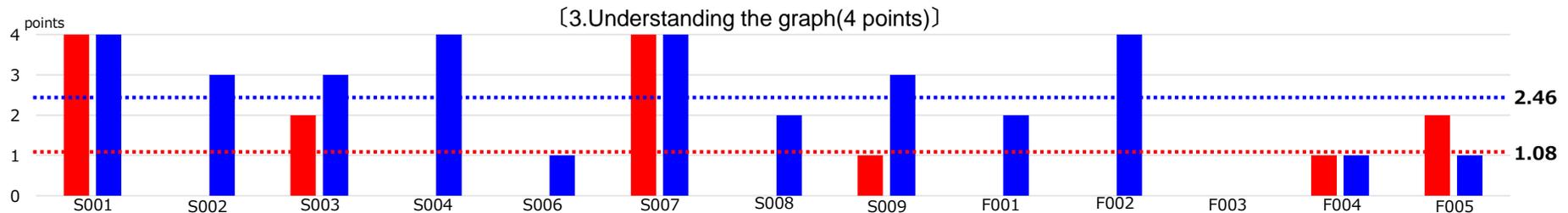
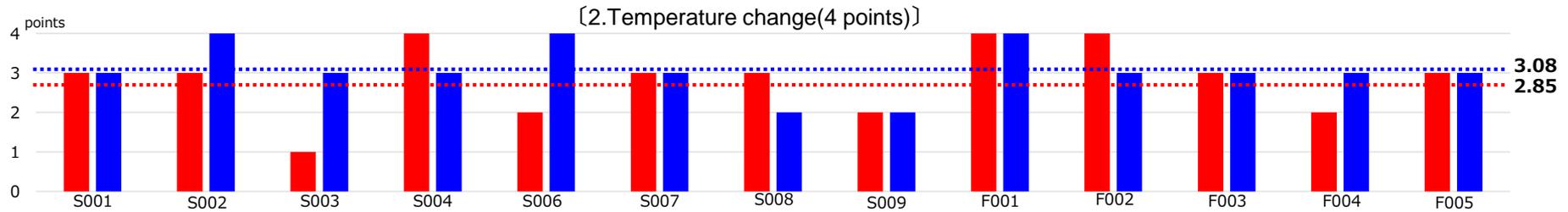
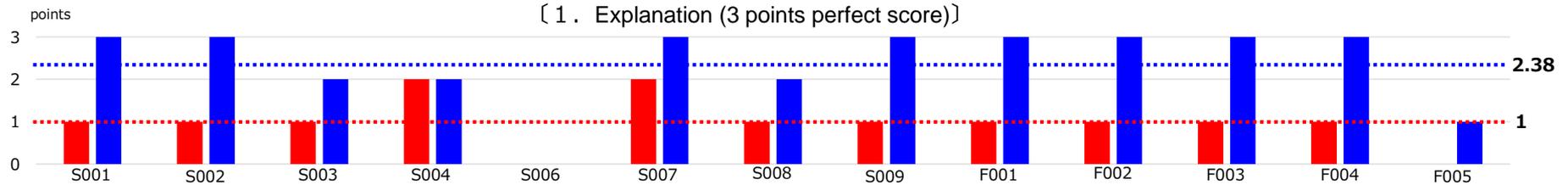
Achievements: List of results of pre / After assessment

- Among the trainees, eight from Showa Women's University Showa Preschool attached to and five from Kindergarten & Childcare First Classroom SETAGAYA, which received both pre-After assessments, were included in the analysis.
- Overall, most children show an increase in their explanation and graph understanding.

| NO | attribute | | assessment | lesson | | result | | | | | |
|-------|-------------|------|----------------------|----------------------|-------------------------|--------------------------------------|-------|--------------------------------------|-------|--------------------------------------------|-------|
| | | | | | | Explanation (3 points perfect score) | | Seat 1: Temperature change(4 points) | | Sheet 2: Understanding the graph(4 points) | |
| | Birth month | sex | Number of attendance | Number of attendance | Tree lessons Attendance | Pre | After | Pre | After | Pre | After |
| S001 | July | Girl | 2 | 2 | None | 1 | 3 | 3 | 3 | 4 | 4 |
| S002 | September | Girl | 2 | 3 | Yes | 1 | 3 | 3 | 4 | 0 | 3 |
| S003 | September | Girl | 2 | 5 | Yes | 1 | 2 | 1 | 3 | 2 | 3 |
| S004 | March | Boy | 2 | 6 | Yes | 2 | 2 | 4 | 3 | 0 | 4 |
| S006 | September | Girl | 2 | 4 | Yes | 0 | 0 | 2 | 4 | 0 | 1 |
| S007 | July | Boy | 2 | 6 | Yes | 2 | 3 | 3 | 3 | 4 | 4 |
| S008 | February | Boy | 2 | 4 | Yes | 1 | 2 | 3 | 2 | 0 | 2 |
| S009 | October | Boy | 2 | 5 | Yes | 1 | 3 | 2 | 2 | 1 | 3 |
| F001 | November | Girl | 2 | 3 | None | 1 | 3 | 4 | 4 | 0 | 2 |
| F002 | October | Girl | 2 | 4 | None | 1 | 3 | 4 | 3 | 0 | 4 |
| F003 | August | Boy | 2 | 5 | Yes | 1 | 3 | 3 | 3 | 0 | 0 |
| F004 | April | Boy | 2 | 4 | None | 1 | 3 | 2 | 3 | 1 | 1 |
| F005 | January | Girl | 2 | 5 | Yes | 0 | 1 | 3 | 3 | 2 | 1 |
| Total | | | | Total | | 13 | 31 | 37 | 40 | 14 | 32 |
| | | | | Average | | 1 | 2.38 | 2.85 | 3.08 | 1.08 | 2.46 |

Achievements: Pre and After assessment differences

■ Pre ■ After Pre average After average (Blank indicates zero point)



Achievements: Digital teaching material developer's voice

Director of Innovation at Kolbe Catholic College
Noburo Hagiwara

- As a learning material for system thinking, we selected video as a medium that easily copes with variables such as learner's age, number of people, learning environment, time, and learning content. In particular, the following criteria were established to help preschool children understand some of the habits underlying system thinking:
 1. I enter the learning task from the materials in the children's life experience.
 2. Don't be instilled, but let children realize themselves.
 3. Images are centered on still images and voicelessness to allow children to freely chat, speak and exchange ideas.
 4. Make videos within 2 minutes to increase the concentration of children.
- Some of the 13 trial teaching materials used in this empirical study are a part of the above, but the above-mentioned things that were aimed at the development came out from the children as expected. At the same time, the points to be improved have become clear.
 1. Shorten the time of the image to increase the degree of concentration.
 2. Make children aware of things they add to narration and read from images.
 3. Add sound effects etc. to promote awareness and discovery.
- I will continue to produce video teaching materials, and I would like to create an environment where anyone can use it on a website, anytime, anywhere.

Program development cooperation garden

Minnanomiraiwotsukuru Shinonome Nursery Directort:Hiroko Narikawa , NPO Florence Supervisor:Sakiko Morinaga

- As I listened to the story of my older child, I realized that I was talking along the flow of time and I could feel growth. I thought that I could find myself by knowing this program.
- If you think about system thinking and you think about various things that occur daily in the garden, and think about the time series change pattern graph, not only what is happening in front of that time but also that morning or a little before that day I think it will help you to think about what happened and the movement of your feelings, and to think about what you really need to solve.
- There is instruction such as being able to write one's name as preparation for admission for older children, or counting to 10, etc. On the other hand, to get into the habit of thinking about system thinking etc. means that what happened in one's own body Is not it helpful to solve it? I feel I can wear it at this time.

Possibilities of System Thinking Education and Future Initiatives

Possibilities of System Thinking Education

- In the complex society, system thinking is widely used as creative thinking that does not follow precedents, and as thinking necessary for creating ideas. Through this demonstration project, in Washington State where Microsoft and Boeing are headquartered, system thinking education is included in the small, middle, and high study guidelines, and children are learning system thinking as part of subject learning. I knew In recent years, research in brain science has progressed, and while the possibility of early childhood education has attracted attention, system thinking education from early childhood on the theme of picture books and familiar life has become active.
- In Japan, system thinking education is conducted as part of adult education. However, according to the board committee specializing in system thinking, Shoji Yoshizawa says that many adults who receive system thinking education find it difficult to acquire the habit of system thinking.
- Although the demonstration project this time was a short period and was insufficient as empirical data, the children acquired the time-series change pattern graph, and what changed in time-series in their own words, why From talking about what has changed, we can see how we are taking the first step towards habituation of system thinkers. Based on the results of this project, we intend to continue long-term demonstration experiments in the future. At the same time, I would like to work on demonstration experiments of system thinking education in elementary schools that already have precedents outside Japan.

Potential for future efforts

- Themes of system thinking education are diverse. In addition to the themes covered in this demonstration project, it is also possible to graph changes in one's own experiences and familiar flora and fauna, and system thinking can be used in various situations in daily life.
- <The target and tools of system thinking education and future possibilities>
 - ① Program development and implementation of utilizing time series change pattern graph in life for infants.
 - ② Development and implementation of programs that use non-graph system thinking tools such as bathtub theory for young children.
 - ③ Program development and implementation of system thinking tools such as connected circles and feedback loops for elementary school students.