Achieving cutting-edge ICT education with all staff in an ordinary public school from the first year of operation

Searching for the Better Future! 世界のあしたが見える学校

Midorino Gakuen Compulsory School

Principal; MORI Yasushi

Midorino Gakuen to nurture change-makers for the Society 5.0 era

- The school opened in April 2018
- In a newly developed residential area away from the city center (Kenkyu Gakuen area)
- It is a public compulsory education school for elementary and junior-high school students
- Being a public school, there are few teachers who are good with ICT

Midorino Gakuen's grand design that can be realized with cutting-edge ICT equipment

None of this would be possible without IC.

21st Century Skills

Nurturing people who can create a prosperous society with hopes and dreams in the age of 100 years of life ・ Problem-solving skills ・ Remote communication with experts using ICT ・ Development of logical thinking skills ・ Presentation of learning outcomes ・ Three-person team speeches

★ Understand how to research 80%

English education for communication

Familiarizing oneself with the sounds and basic expressions of a foreign language and developing communication skills.

・ English activities from Grade 1
・ Grades 3 and 4: 35 hours
・ Grades 5 and 6: 50 hours

World's most advanced ICT education

・ Nurturing of the information utilization skills necessary for the future and the Utilizing ICT ・ Advanced ICT education "7C Learning" ・ Programming for all grades ・ Classes that can be understood with electronic blackboards and digital textbooks

★ Certified as an advanced IT school

Realizing the SDGs sustainable society

Fostering leaders of a sustainable society where each individual sees various issues as his or her own.

・ Utilization of the International Lake Environment Committee ・ Promotion of the environmental IEC movement ・ Promotion of global education ・ Career education to foster

Problem Solving STEAM Education

Educational Development in Tsukuba, a city of science and robotics

・ Cooperation with the University of Tsukuba and Tsukuba Gakuin University
・ Collaboration with research institutions and robotics companies
・ Organizing of art and robot programming classes

★ Robot lessons 5 times a year

Collaboration and connection among kindergarten, preschool, elementary, junior-high, high school, and university

・ Eliminating the first grade problem by sharing the kindergarten and nursery school "Approach and Start Curriculum"
・ Promoting high-school-university cooperation and specialized learning. Creating opportunities to ignite future dreams (excitement engine)

★ 80% of 1st graders enjoy school

Nurturing the change makers for the Society 5.0 era
Midorino Gakuen

Providing education that fosters the 21st century skills necessary for the change-makers who can shape the future of the 2040s.

- Full-time homeroom teacher system from 5th grade
- Systematic curriculum based on developmental stages
- Practicing SDGs throughout the school
- Promoting advanced ICT education among all staff.
- Learning programming from Grade 1
- Problem solving STEAM learning
- English from Grade 1
- Active learning

Development of an ICT-based educational program to foster 21st Century skills

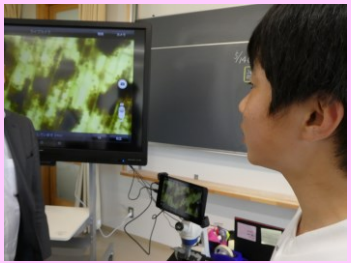
KIDS DESIGN AWARD 2018

Kids Design Award 2018
President's Award

Cooperation

Collaborating with universities on robotics projects via distance learning

Communication



Exchange of opinions of experimental results using a large presentation device

Critical thinking

Diverse ideas with mathematics active learning tools

Computational thinking

Learning English through robot programming

Comprehension

E-learning using the Tsukuba Education Cloud

Creativity

STEAM Learning
Project to Save the Earth with SDGs Programming

Citizenship

Proactively contribute to society by communicating to the world through presentations

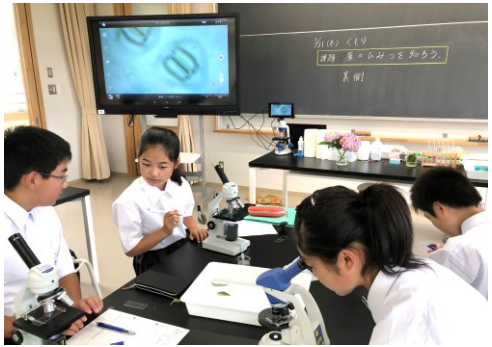
Cutting-edge ICT environment for exciting learning

Futuristic active learning room

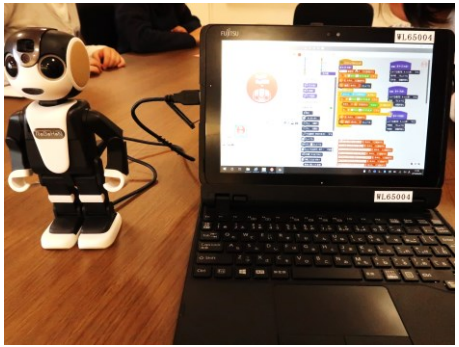
Media room to foster creativity

One GIGA terminal per child

High-speed optical fiber line



All classrooms are equipped with a 65-inch large-screen presentation device



Robot for programming

One PC per teacher for school admin

Wireless LAN throughout the school

Results of the use of cutting-edge ICT

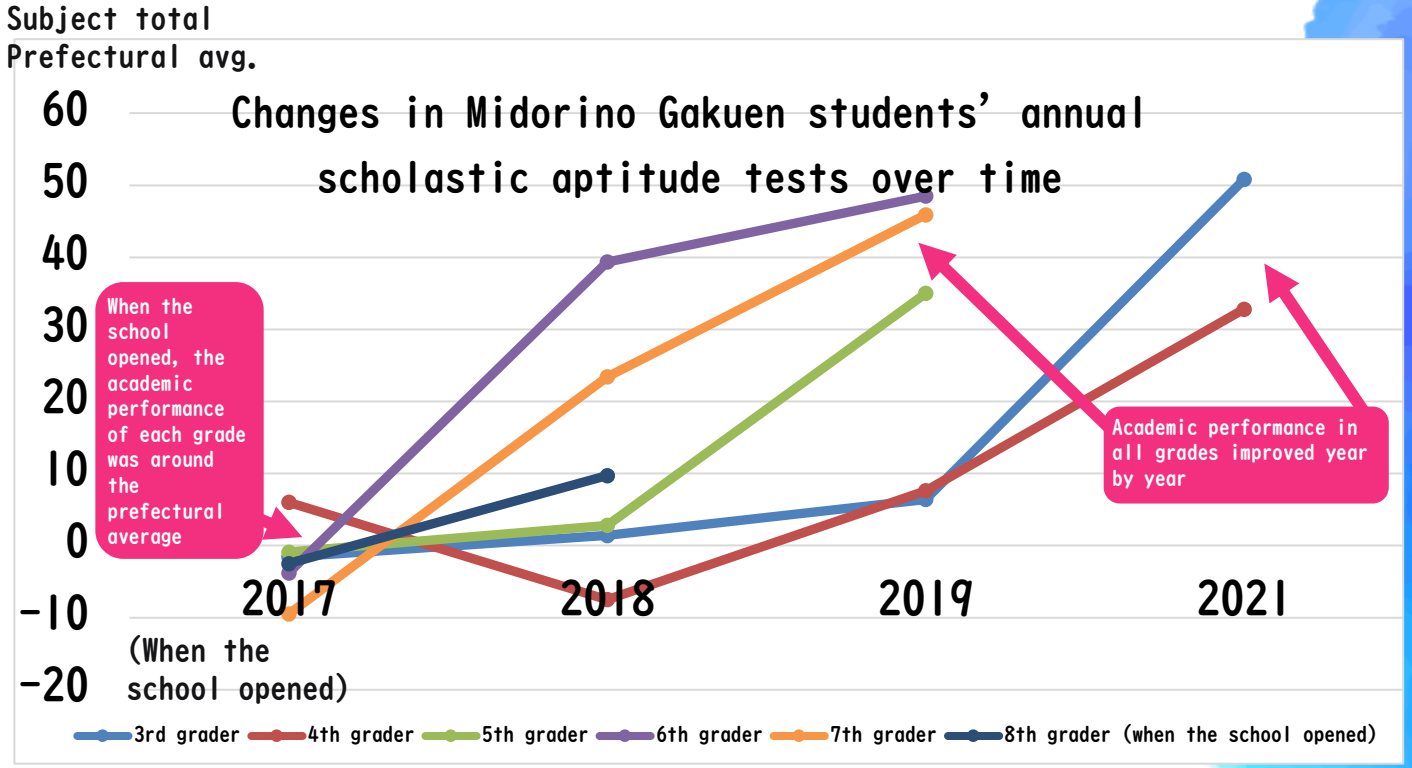
Midorino Gakuen

[Results] Midorino Gakuen - Changes in Student Attitudes

Programming together (3rd Grade)

- I understand the lessons using the electronic blackboard: 97%
- Using a PC in class is fun: 98%
- Programming is fun: 95%
- I became better at presentations: 76%
- We used PCs to learn from each other: 90%
- I want to use a PC again next year: 97%
- I became able to study better: 91%

[Result] Midorino Gakuen - Improvement in Academic Achievement

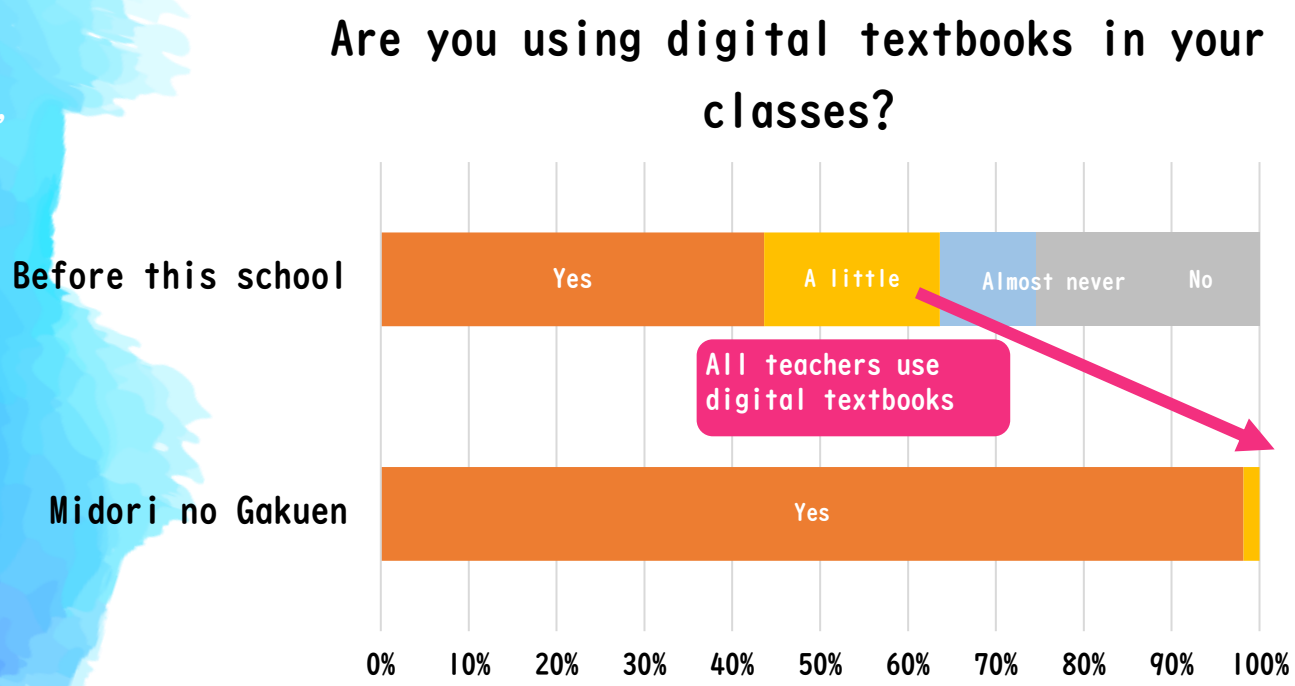


- Graph showing changes over time in the annual scholastic aptitude tests conducted in Ibaraki Prefecture
- Not conducted for Grade 9 in 2020 and 2021 due to the pandemic
- Comparison with the prefectural average percentage of correct answers in four subjects for 6th graders and five subjects for 7th graders and above
- When the school first opened, each grade was around the prefectural average, you can see that academic performance has improved year by year

[Results] Midorino Gakuen - Changes in Teacher Attitudes

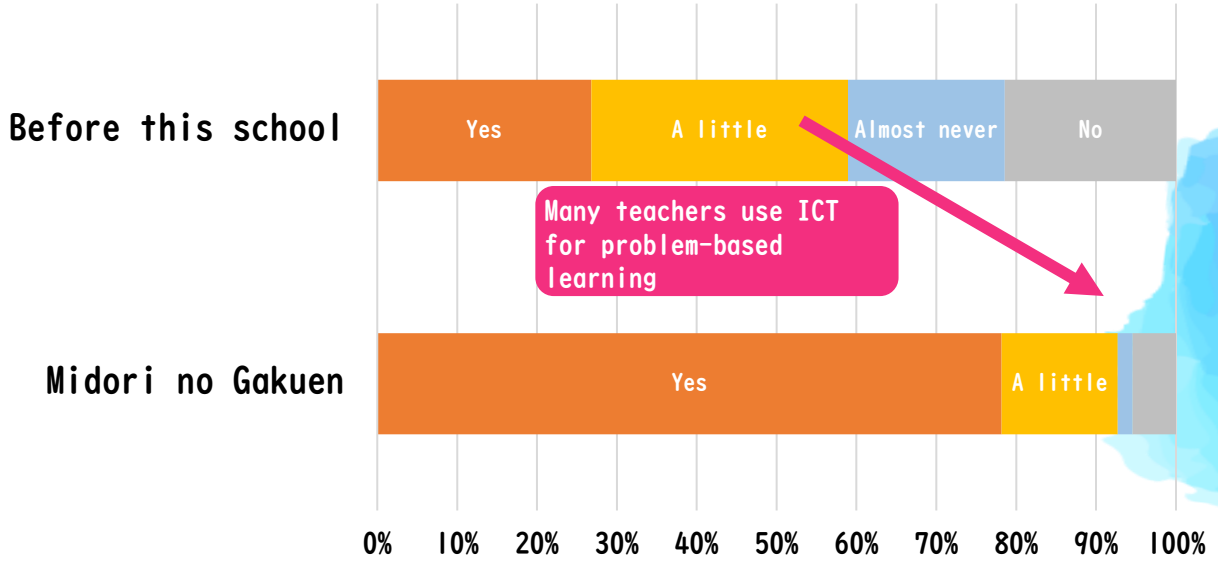
- Installed large presentation devices in all classrooms, including special needs classes and special classrooms
- After being assigned to the school, all teachers use digital textbooks
- Digital textbooks are easy to use, even without a manual

Reappointed teachers also actively utilize them



[Results] Midorino Gakuen - Changes in Teacher Attitudes

School students' use of ICT in problem-based learning



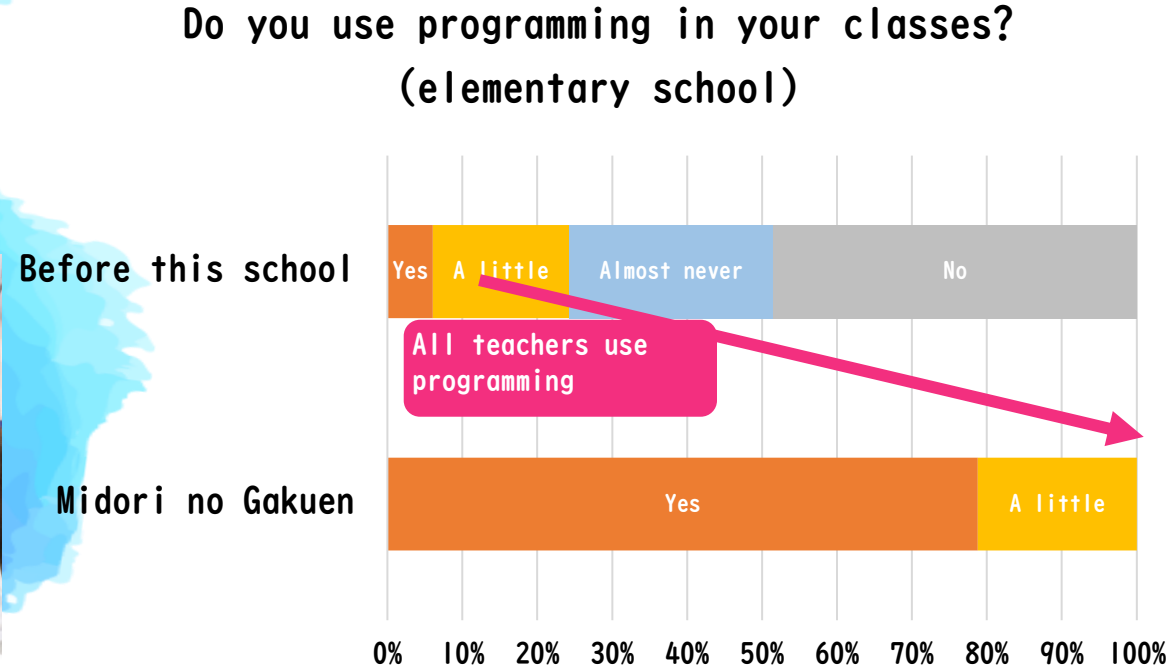
- Before being assigned to the school, about 60% of the teachers used ICT for problem-based learning
- At the school, more than 90% of the teachers use ICT (collaborative learning tools) for problem-based learning
- They also use it in Grade 1 and special needs classes

Newly hired teachers also make good use of it

[Results] Midorino Gakuen – Changes in Teacher Attitudes

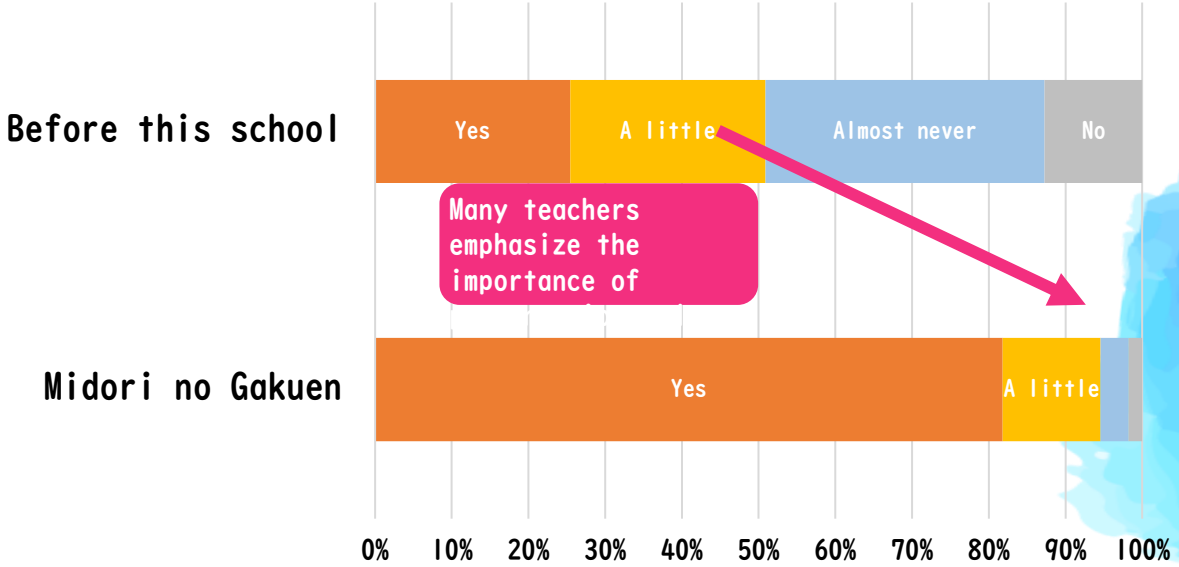
- All elementary school teachers are using programming in their classes.
- Children learn not from their teachers, but from each other, books, YouTube, etc.

Robot programming



[Results] Midorino Gakuen - Changes in Teacher Attitudes

Presentations by students using a large presentation device



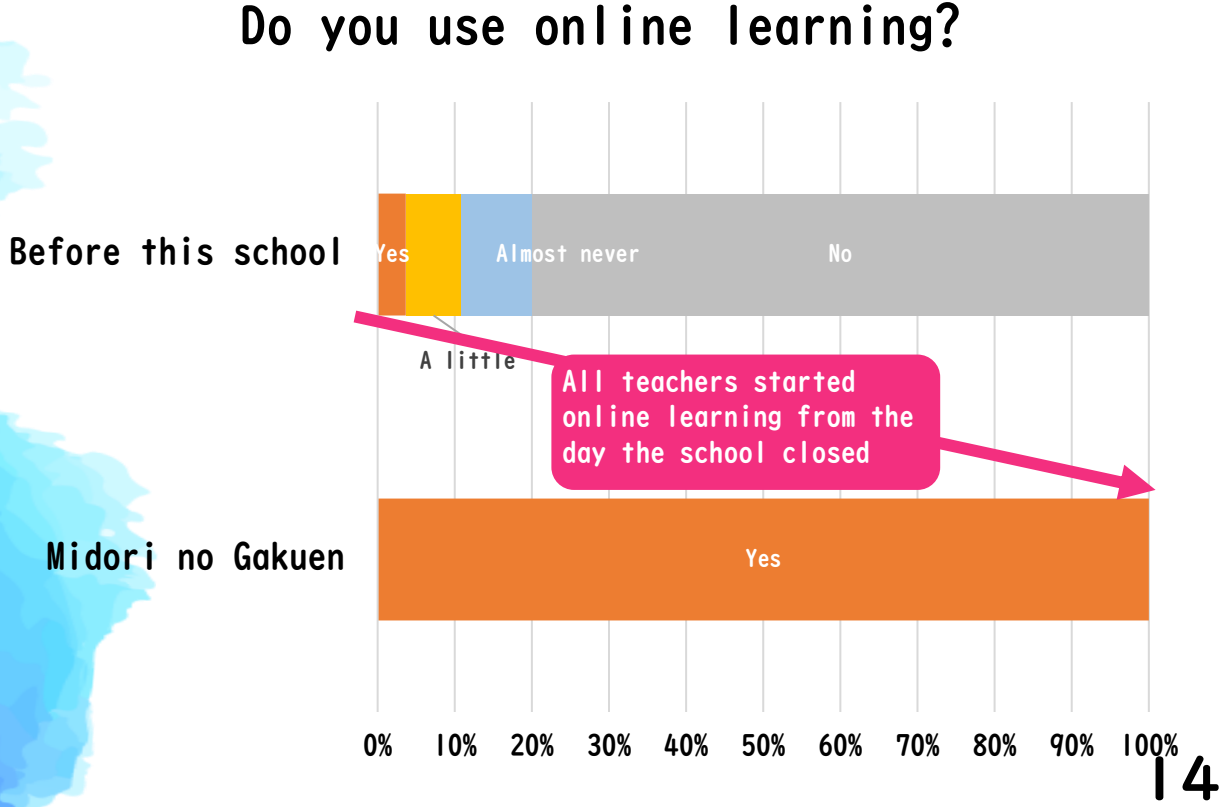
・Many children in Japan are not good at giving presentations, but at our school, presentations are given as the result of problem-based learning

Presenting to the world in English

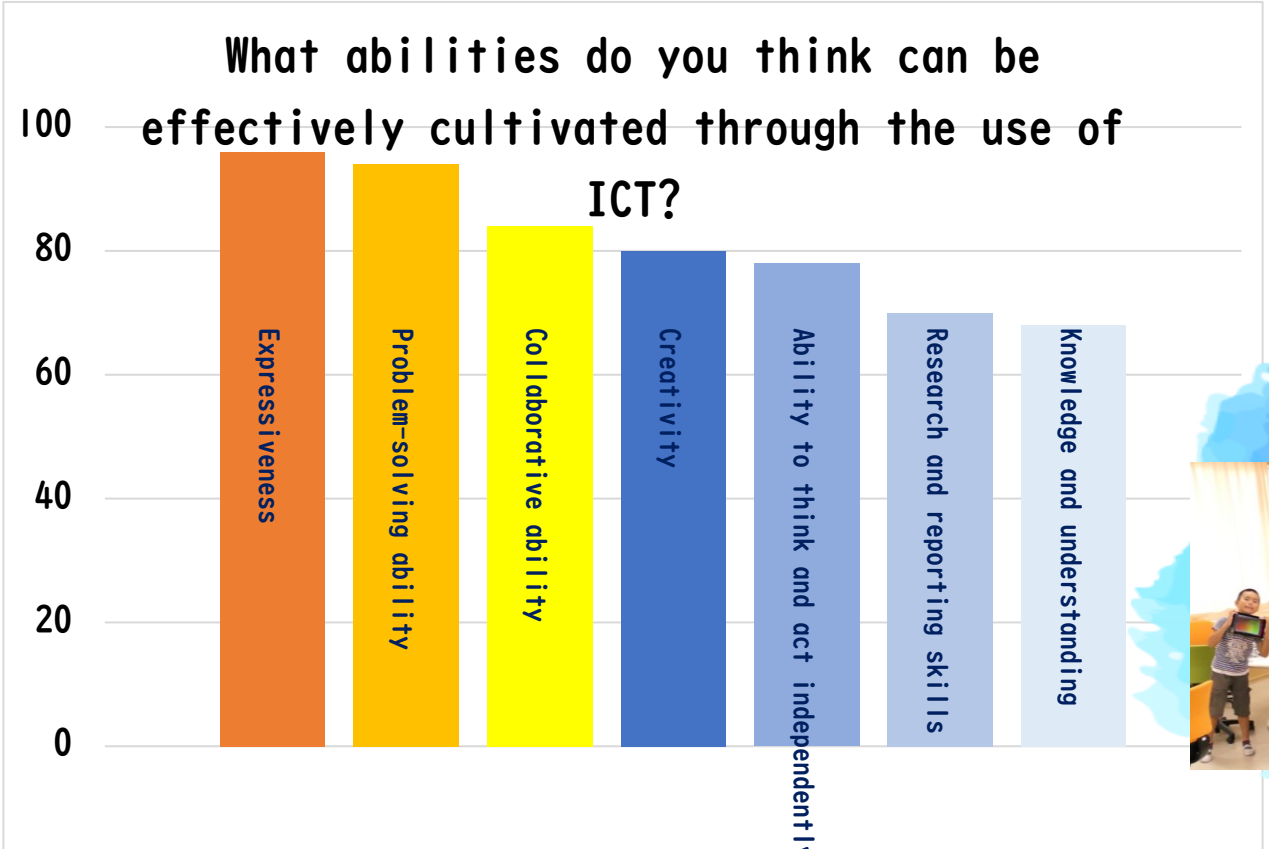
[Results] Midorino Gakuen - Changes in Teacher Attitudes

- All teachers started online learning the day the school closed
- The children use it regularly, so it was not a problem
- Teaching each other in the grade and thinking about implementation methods

Reappointed teachers also enjoy online learning



[Results] Midorino Gakuen - Changes in Teacher Attitudes



- Many teachers believe that ICT can be used to enhance a variety of skills
- By using ICT, we are able to break away from the conventional simultaneous classes that have been common up to now

Practice of using cutting-edge ICT

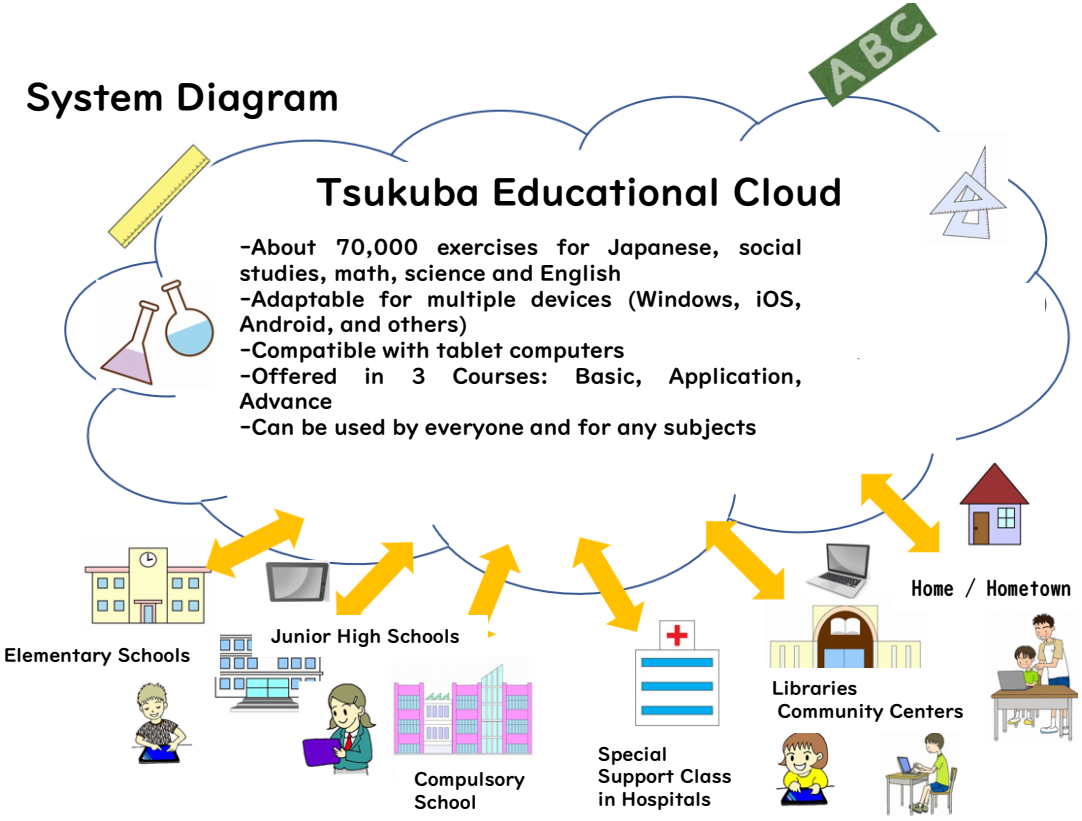
Midorino Gakuen

開校１年の普通の公立学校の全職員が
ICT先進的教育で学力向上を図り
コロナ休校翌日からオンライン学習

Searching for the Better Future! 世界のあしたが見える学校

みどりの学園義務教育学校

The Tsukuba MOOC transcends the boundaries of grade subjects "Tsukuba Education Cloud" for learning anytime, anywhere



・E-learning allows one to study any subject at any grade level according to one's interests and learning progress

Anytime

Anywhere

Whoever

Any learning

Students can study at their own pace, with subjects they are good at in the higher grades and subjects they are not so good at in the lower grades

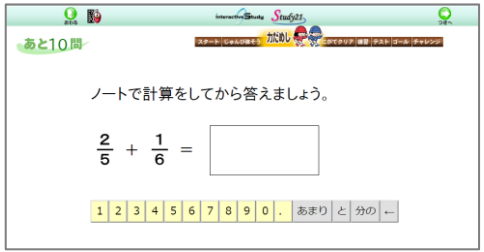
The Tsukuba MOOC transcends the boundaries of grade subjects
"Tsukuba Education Cloud" for learning anytime, anywhere

How AI Learning Works

Not simple repetition of teaching materials

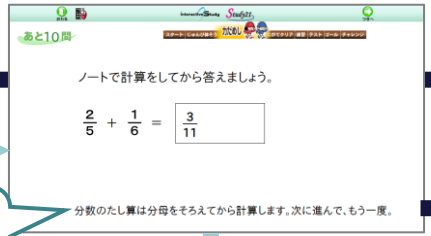
Presenting problems according to the child's level of understanding

Example: 5th grade arithmetic "Addition and subtraction of fractions"



When answer is correct

When answer is incorrect



Messages are displayed according to the answer.

To next question

2nd time When answer is correct

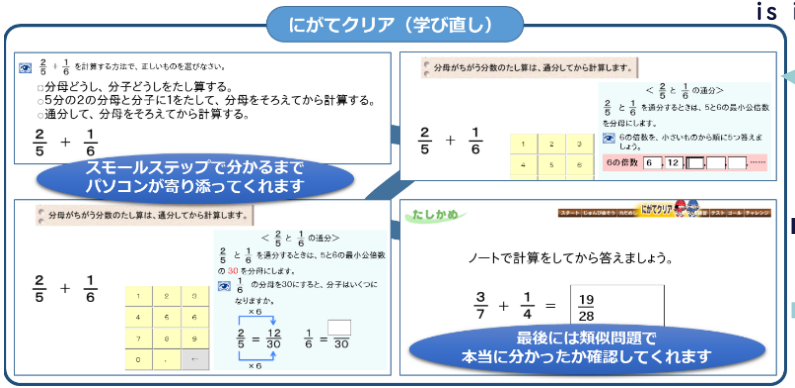
2nd time When answer is incorrect

* In case of an incorrect answer, a hint will be displayed to encourage you to try again.

Check for yourself that you have understood from similar problems and move on to the next problem.

When answer is correct

When answer is incorrect

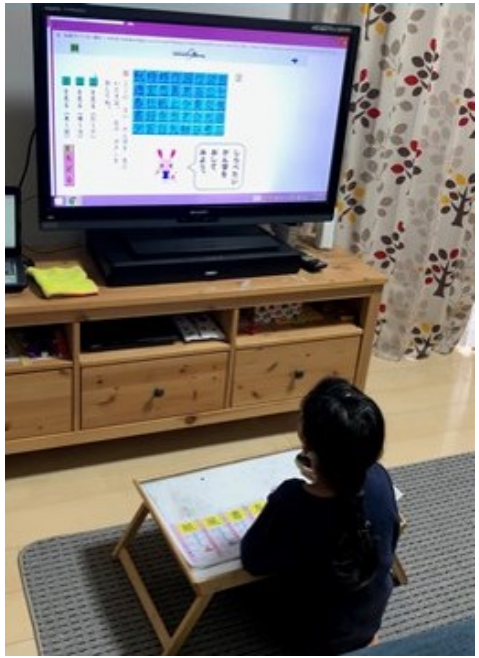


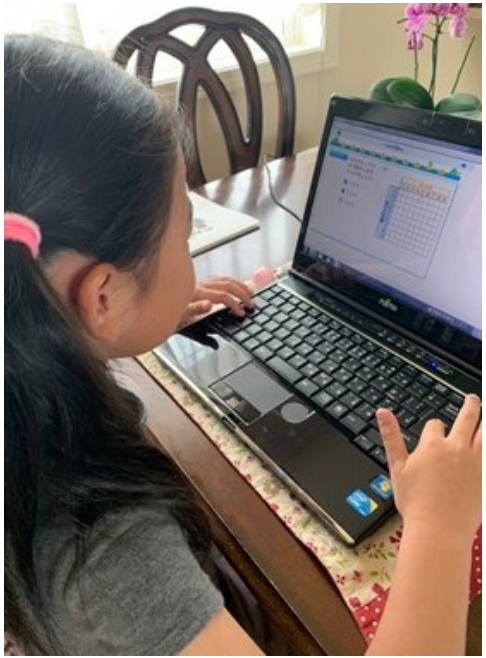
Call your teacher

The system will determine that you need tutoring from your teacher and will display a screen to ask your teacher for advice.
* Display can be turned on or off in the settings

The Tsukuba MOOC transcends the boundaries of grade subjects
”Tsukuba Education Cloud” for learning anytime, anywhere

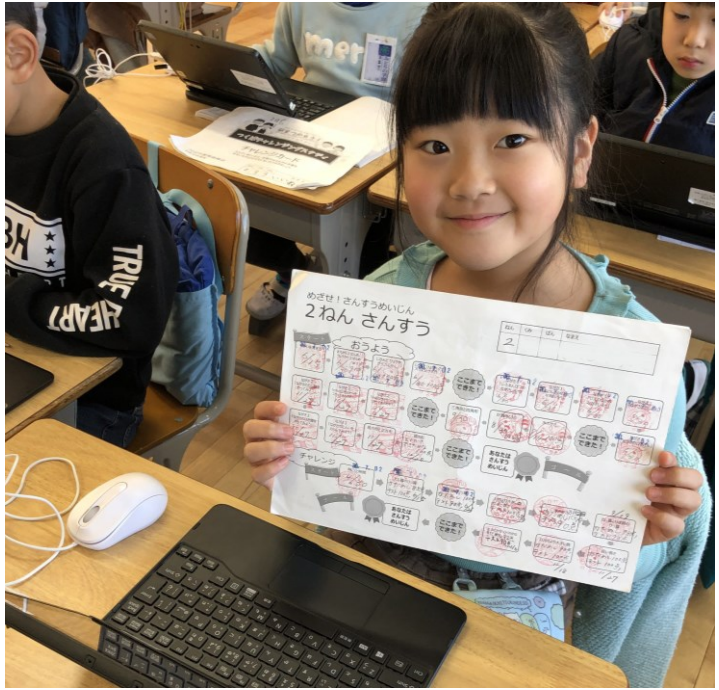
Self-paced e-learning at school



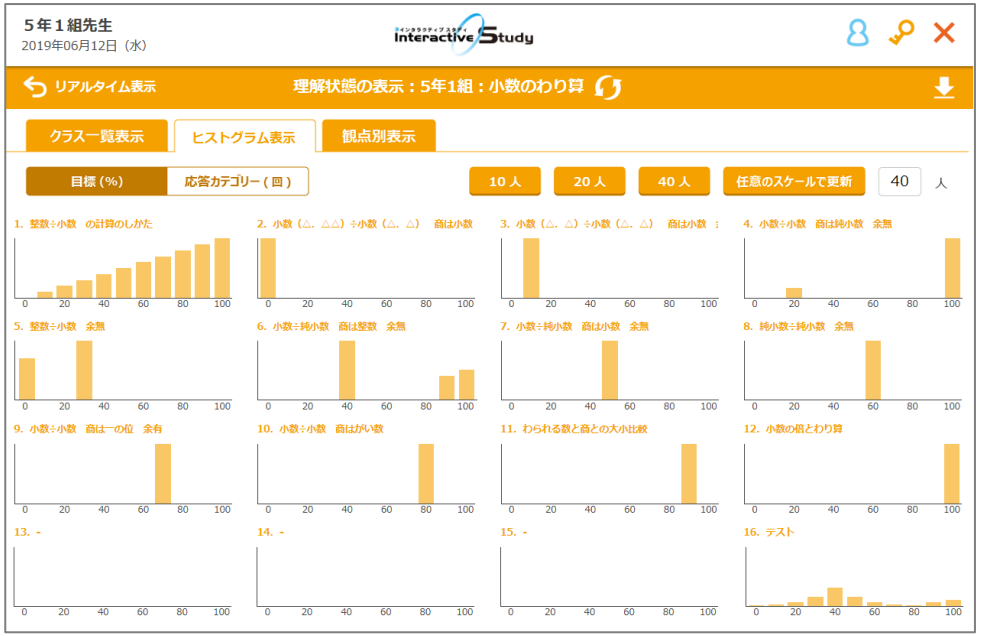


E-learning from home according to one’s interests

The Tsukuba MOOC transcends the boundaries of grade subjects
"Tsukuba Education Cloud" for learning anytime, anywhere



Second graders who have already completed arithmetic in the middle of the school year



Individual study history (score, time, number of times, etc.)

Senior students provide computer operation support to 1st graders

- Teachers with few ICT skills are not necessarily less valuable as teachers

- Students learn PC skills independently, by being taught by the seniors, by teaching each other, and by researching books and the Internet

- What is important for teachers is to produce the lessons, act as a facilitator, and recognize and evaluate each student's learning

Grade 1

Japanese

Let's make a "picture of a scene of reading aloud" using programing

Programing

★ Aim of the subject

Choose a favorite scene based on logical reasoning, capture the scene's scenery and emotion, and read it aloud

★ Aims of learning programming

To animate the scene you want to read aloud, break the story down into scenes.

Combine and reassemble the disassembled elements with animation.

Even inexperienced teachers can have fun.

Children take the initiative

Enjoying programming together

Grade 2 | Art | I love stories! "Mysterious Egg" | Programing

Using the programing learned in Grade 1

★ Aim of the subject

Imagine what is born from the egg, and learn the fun of expressing the patterns of the egg and what is born from it.

★ Aims of learning programming

Deconstructing the movement created from an egg in animation creation

Think about the movement and let your creativity grow

Learn by seeing examples works

Hint cards for children

Completed Mysterious Egg

Grade 5 | Society | Let's make a "food producing area quiz" | Scratch

Utilizing the branching acquired in Grade 4

★ Aim of the subject

Students can create learning problems based on the current status of food production in Japan and to discuss and think about food production in one's country

★ Aims of learning programming

Be able to program Scratch branching and setting random questions about the origin of foods

Japan's declining self-sufficiency rate

Scratch hint cards

Random questions

Presentation of the quiz

Grade 5 | Arithmetic | Let's make "regular polygons" | Scratch

★ Aim of the subject

Students can review the properties of regular polygons. Students can understand the relationship between polygons and circles and have a perspective on the study of circles

★ Aims of learning programming

Students can deconstruct and reconfirm the properties of regular polygons. Students can deduce that as we increase the n of a regular n-gon, we approach a circle

Consider 3-, 4-, and 5-sided polygons

Programing various polygons

Presenting programs

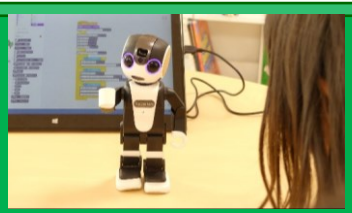
Grade 5 | Combined | Environment card reader with Robophone | Scratch

★ Aim of the subject

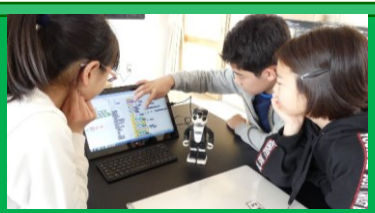
SDGs and environmental education using "environment cards" created by high school students

★ Aims of learning programming

Programming using their own ingenuity, such as "never read a card twice, read cards randomly", etc.



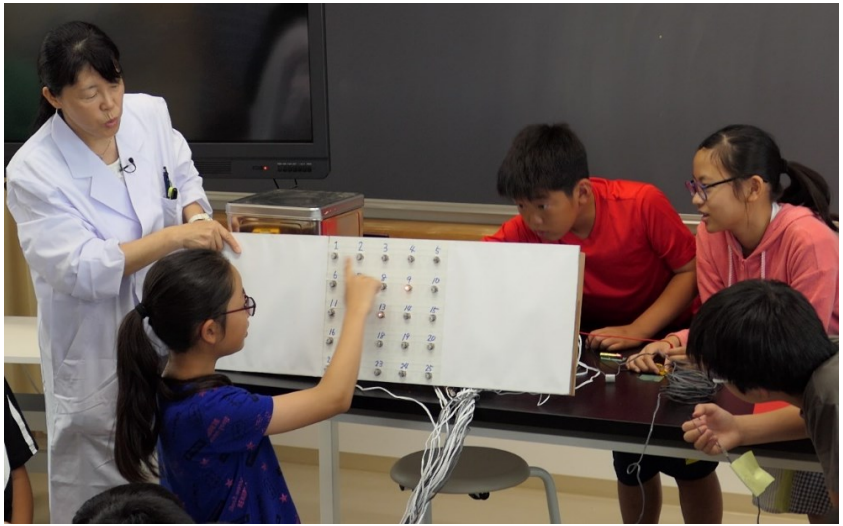
Using Scratch



Create the reading method as a group

Make robot the reader, controlled with Robophone

Grade 6 | Science | Let's make an "electric bulletin board" with micro bits | Scratch

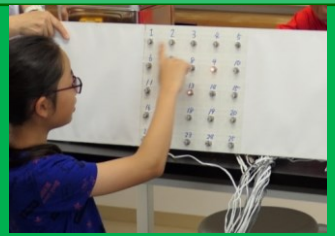


★ Aim of the subject

Students can understand scientifically the use of programs in the use of electricity by creating an electric bulletin board with micro:bit.

★ Aims of learning programming

Through a program, students will be able to understand that the use of electricity can also lead to increased efficiency.



An electronic bulletin board that resembles a micro:bit

Creating an electric bulletin board with a micro:bit

Grade 6 | Combined | Project to Save the Earth with SDGs Programming | STEAM

★ Utilizing the various programming teaching materials that have been used up to now
Project-based learning in which children independently choose programming and attempt to solve problems in order to achieve the goals of the SDGs

Drone lifesaving program

SDGs with micro:bits

Alleviating poverty with Minecraft

Creating a livable city with sensors

SDGs with Scratch

Grade 6 | Combined | Project to Save the Earth with SDGs Programming | STEAM

The one-child, one-PC environment fosters children's creativity. Lots of smiles.

Club activities | Science club | Student-made food chain programs to be shared with the world | Scratch

- Science club Scratch programming
- Food chain program
- An area in which one's talents have not been recognized
- Learning programming to recognize and develop unique talents
- Presenting in English to the world


Controlling insect activity with temperature


Creating ecosystems in Scratch

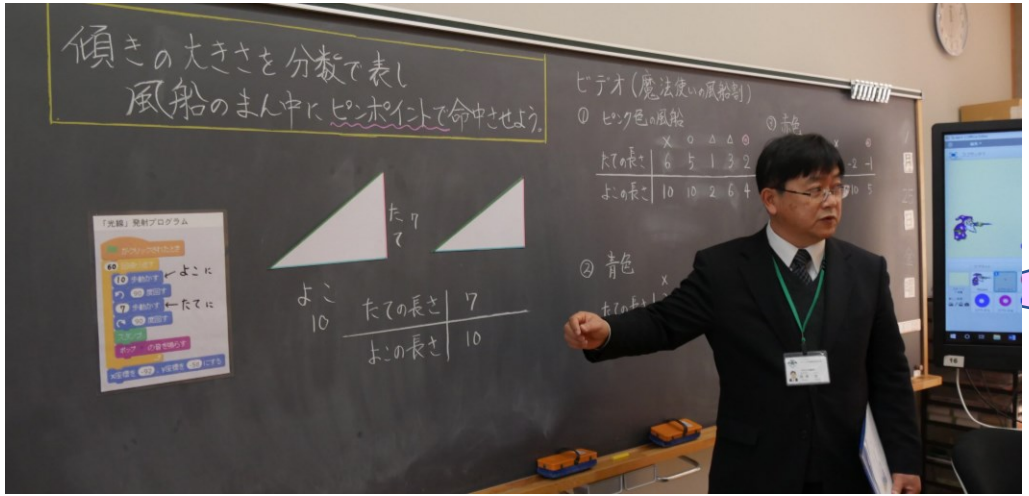
Seniors staff take over and make improvements

Special needs

Math

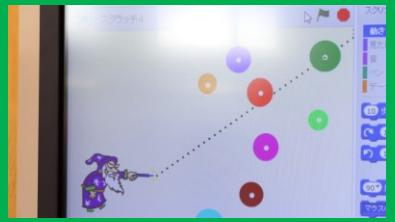
Having fun learning with Scratch teaching materials made by teachers

Scratch



Easy to correct
Try as many times as you want

Let's try it this way next time



Express the degree of the slope as a fraction

Self-solving with teacher-made program teaching materials

Realization of independent and interactive deep learning - Visualization of thinking
Active learning with class participation by all students

Elementary arithmetic:
Drawings

① Tasks sent out by the teacher

② Solve tasks individually

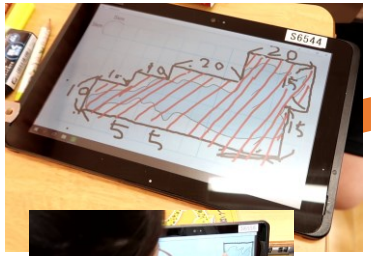
③ Active learning

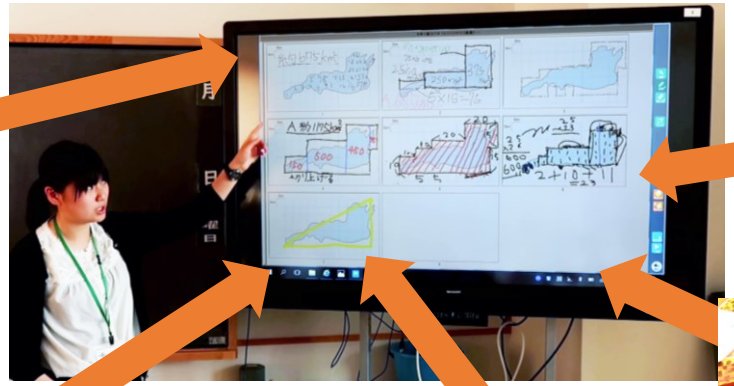
④ Sent to teacher
Different ideas come

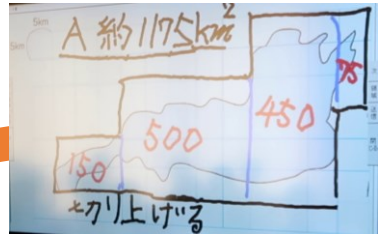
⑤ Children proudly presenting their compared solutions

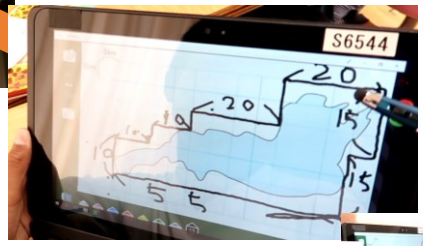
* Creation of new ideas
* From simultaneous classes to active learning

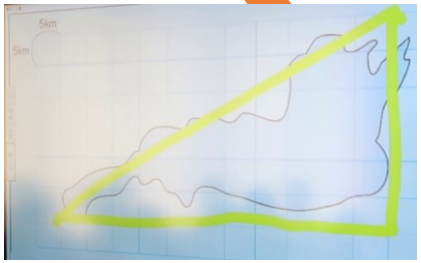
Realization of independent and interactive deep learning - Visualization of thinking
Active learning with class participation by all students

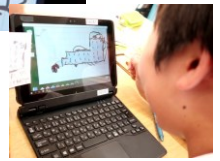


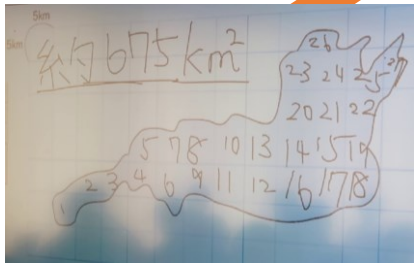












* Opinions of the children who have not been able to present so far are also displayed
* From learning for some students to lesson where everyone participates
* Education that leaves no one behind

Realization of independent and interactive deep learning - Visualization of thinking Active learning with class participation by all students

Solving problems from the teacher

Presentation on a large presentation device

From a class that seeks answers that are either correct or incorrect to a class that generates new ideas and knowledge from each individual's ideas

Grade 1

Tsukuba Style Department

What is the color of Spring?

[Aims of ICT use]

- By using tablets, students can take as many notes as they like
- Return to the classroom, connect the tablet to the large display device, and immediately interact with everyone.
- Have fun introducing the colors of spring one found to one's friends

Shooting images with a tablet

Share the spring one found with one another

Color classification and comparison

Grade 4

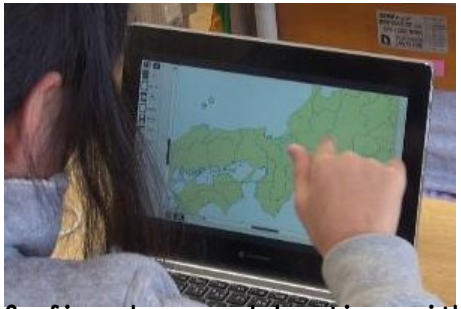
Socie ty

Let's introduce the shapes and local specialties of the prefectures through programming.

[Aims of ICT use]

- Output learning results for each prefecture
- Using digital textbooks for learners in the cloud
- Learn from each other by making a quiz with Scratch
- Programming what kind of quiz to make, and improving the ability to assemble a scene.

Instruct in each script



Confirm shapes and locations with digital textbooks

Learning from and with friends

Grade 5

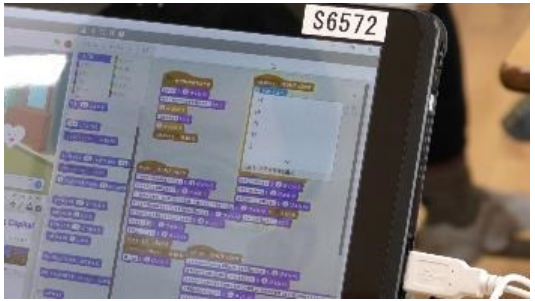
Tsukuba Style

Let's introduce recommended countries in English

[Aims of ICT use]

- Programming with Scratch to ask and answer questions about recommended countries in English.
- Using pictures and diagrams to explain in an easy to understand way.
- Presenting while communicating in English
- Ask your friends to teach things you do not understand or try it yourself.

Programming with Scratch



Matching the timing of the display

Select the items you want to see

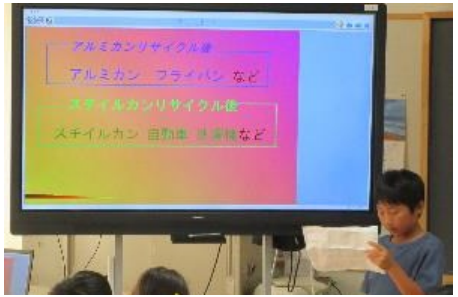
Grade 5

Tsukuba Style

Let's spread the word about eco-friendly living with SDG stickers

[Aims of ICT use]

- Large number of SDG stickers with easy-to-understand designs
- Easy to make, easy to fix if you make a mistake, and you can come up with many different types.
- Present the idea behind the stickers and explain the design.



Explaining the need for eco-friendly living

Ingenious design

A wide range of ideas

Grade 6

Tsukuba Style

Create the home of the future with Minecraft!

[Aims of ICT use]

- By using Minecraft, you can perform repeated trial and error.
- Each student can use a tablet to solve problems according to his or her own level.
- By projecting the program screen and the execution of the program on the large display, it can be used as a hint for problem solving.

Programming agents to accomplish their own tasks.

Grade 7

Science

Let's find out the secrets of volcanoes.

[Aims of ICT use]

- Share the images that only you see with your group or class.

- The use of tablet scopes enables deeper learning than ever before.

Take a picture of what you see under the microscope with your tablet and share it with everyone.

Grade 7

English

Introduce some of your favorites

[Aims of ICT use]

- Present your favorites in English
- Improve speaking skills by providing more opportunities to give prepared presentations.
- Use pictures and photos to communicate enthusiastically in English what you and your friends like

Make repeated presentations in rotation

Presentation and English conversation in pairs

Evaluate one another when finished

Grade 8

Music

Let's make a PR song for Midorino Gakuen

[Aims of ICT use]

- Using Vocaloid, anyone can create music easily
- Even if you do not know rhythm or pitch, you can create a song just by selecting the notes and play it back anytime you want.
- Increase opportunities to listen to each other and exchange opinions

Mid-term presentation in groups

Explanation of the key points of the composition

Introduction of the completed PR song

Grade 7

Tsukuba Style

Let's introduce Midorino Gakuen using AR

One device per group, simultaneous connection and cloud use

[Aims of ICT use]

- What is AR?
- Let's experience AR.
- Let's shoot a video to introduce Midorino Gakuen.
- Let's introduce Midorino Gakuen with AR.

Experiencing the AR app "Machi-Aruki"

Let's shoot a video to introduce Midorino Gakuen

Grade 1

Foreign languages

Let’ s go to Robophone Shop! Let’s have fun shopping

[Aims of ICT use]

- Buy items you learned in English at the store
- The shopkeeper is a robot, so even if you make a mistake, you can have fun trying again and again
- If your pronunciation is correct, the robot will respond
- We created four stores to increase opportunities for fun English conversation.

Shopping with a robot shopkeeper　Shopping in English at four different stores　If you can say it in English, you get a card

Grade 4

Tsukuba Style

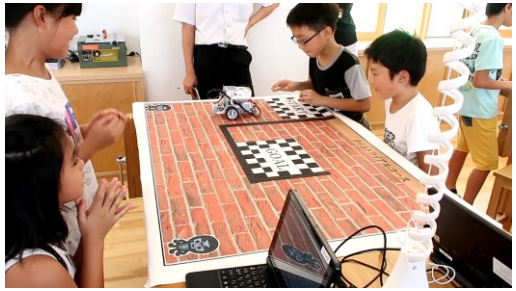
Time trial race with LEGO MIND STORMS

One device per group

[Aims of ICT use]

- I wanted to acquire thinking skills by learning programming.
- It moves exactly as it is programmed to, so you can quickly notice any mistakes.
- Even students who are not good at learning were able to work on it independently.
- It was difficult to make the car turn.

The whole class



Creating the program

The created program

Grade 4

Science

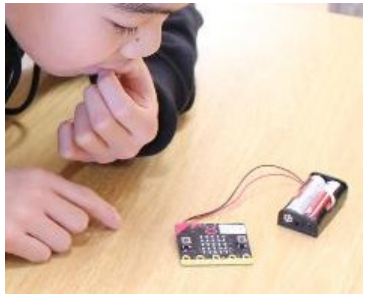
Let's measure the movement of the stars using the micro:bit.

One device per child, simultaneous connection and cloud use

[Aims of ICT use]

- Learn that the micro:bit sensor can be used to measure "azimuth and altitude," which are necessary for observing celestial objects.

- Learn about the functions of the micro:bit and realize that it can be used for various measurements through programming. Have an interest in the active use of devices with built-in sensors because of the difference from conventional astronomical observation methods.

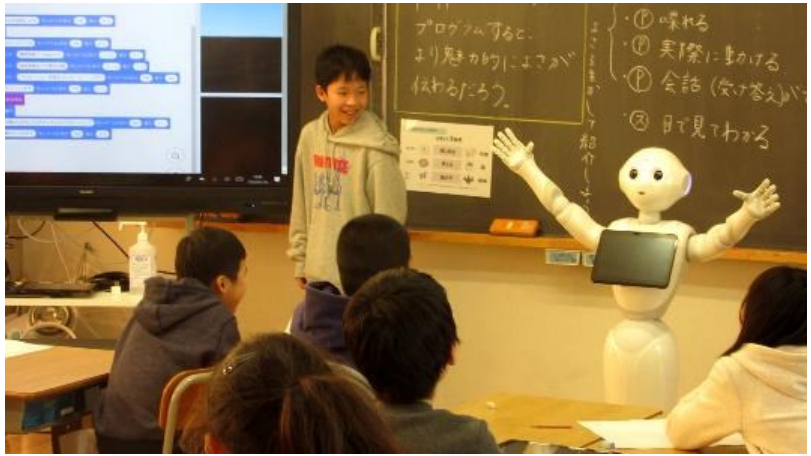


Check the micro:bit program screen and the values displayed. It was found to be possible to observe azimuth and altitude.

Grade 5

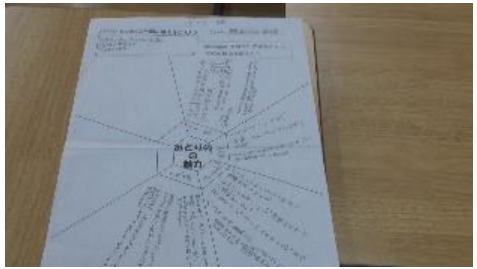
Tsukuba Style

Let's use Pepper to introduce the good points of the school



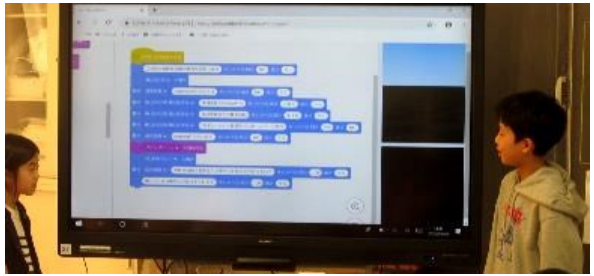
[Aims of ICT use]

- Students will rediscover the advantages of school and realize the advantages of using robots.
- A group of three students will program on the screen using Robo Blocks, and in the second half of the class, they will actually try to make Pepper move.
- They were very interested, knowing that they could program Pepper, which they had seen in stores. Everyone looked enthusiastic.



Fill out a worksheet on the good qualities of the school

Programming while discussing in groups of three

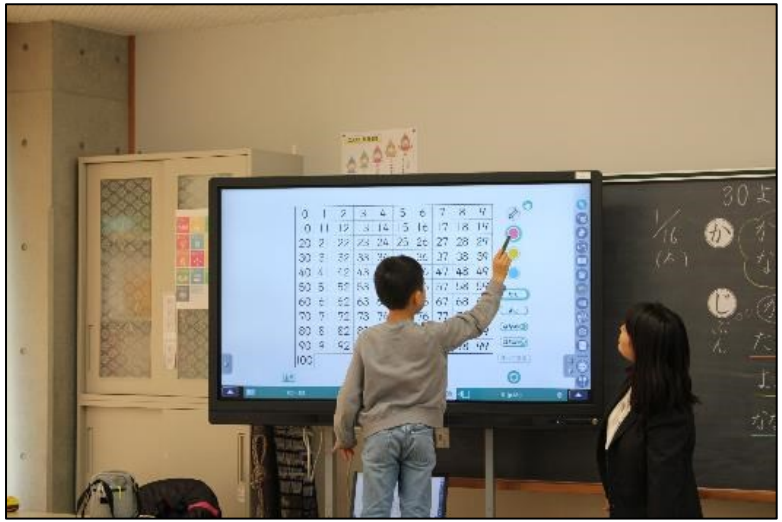


To help notice the good points of the contents and programs by presenting them

Grade 1

Arithmetic

Numbers larger than 30, digital textbook large presentation device



[Aims of ICT use]

- By enlarging the "table of numbers up to 100" using the digital textbook, we were able to look at the arrangement of numbers from multiple perspectives
- Since the students could easily operate the system, they were able to explain their ideas to the whole group, and even the younger students were able to make substantial comparisons
- Even students who are not good at arithmetic can give presentations with confidence

Worksheets identical to those in digital textbooks

They can be explained clearly to the whole group

Visualization makes it easier to understand

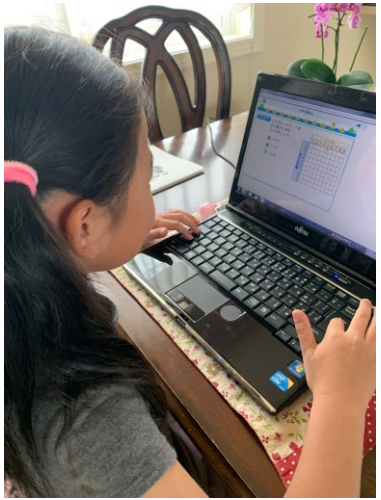
Problem-solving interactive learning through online learning

- Online learning started from the first day of school closure, April 7, 2020
- Online learning video creation (over 500 videos)
- Health observation and consultation... ”Sensei ano ne”
- Use of parent email and survey functions
- Administering online tests for learning assessment
- Over 15,000 hits per day

Problem-solving interactive learning through online learning

Online video creation by teachers

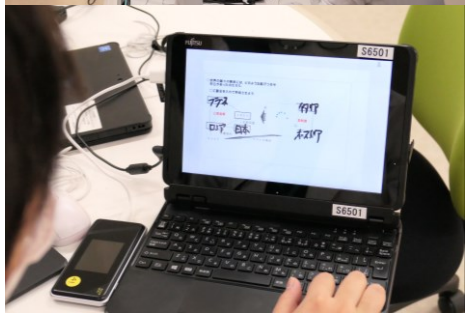
Children watching online videos at home



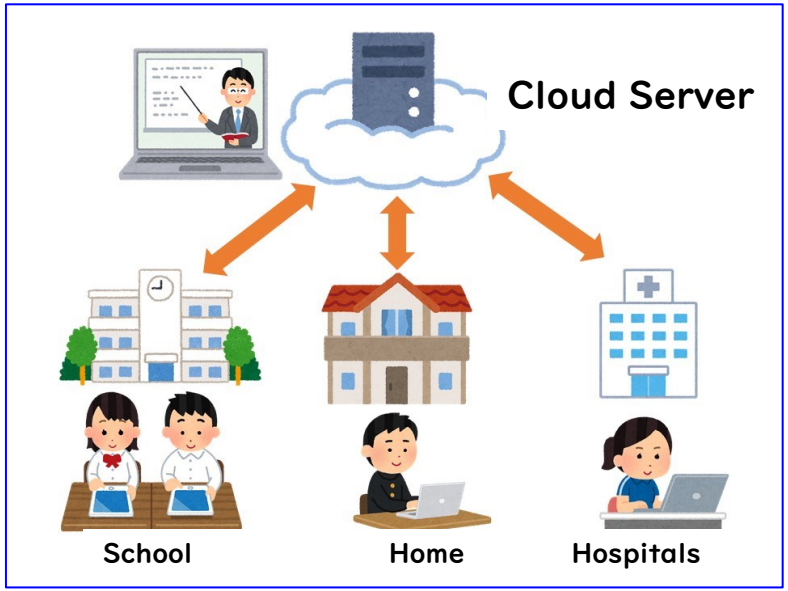
Children doing e-learning at home

Problem-solving interactive learning through online learning

School (Teacher)

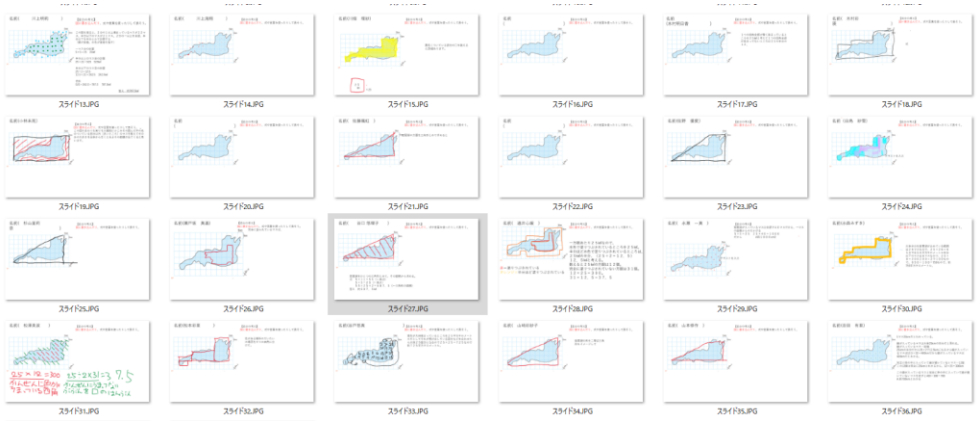


Home economics (Students)

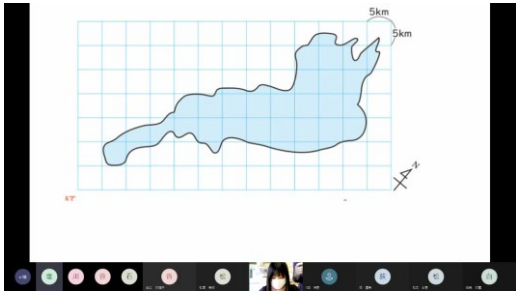


- Online classes using GIGA terminals
- Using Teams for interactive learning. Continuing online for students who do not attend school even after the break

Problem-solving interactive learning through online learning



Solving problems from the teacher



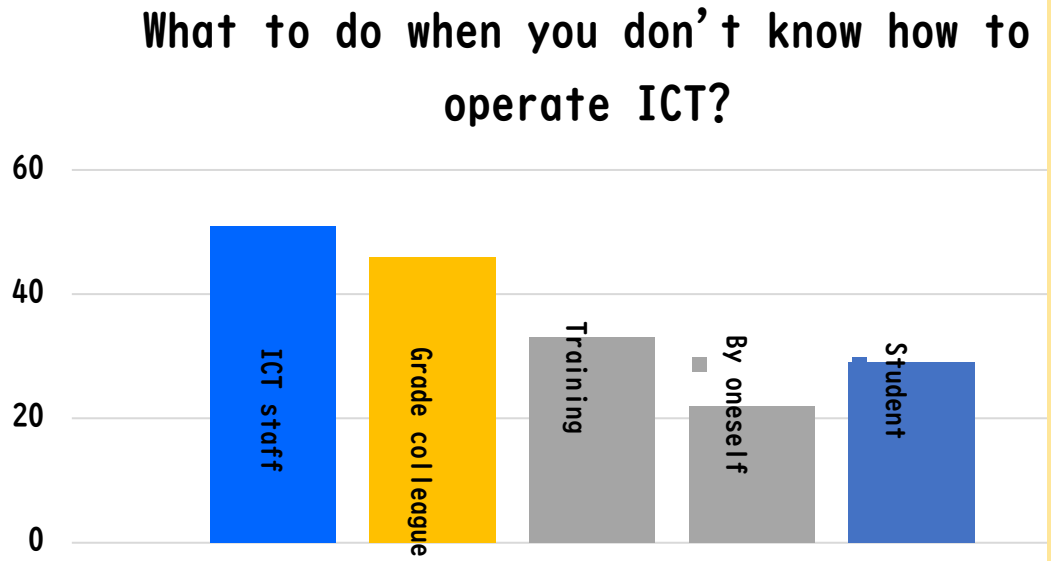
- Online learning tends to be a simultaneous classes
- Solve problems that have no right answer. Problem-solving learning
- Fun and exciting learning

Sending out information to the world in English – Grade 5 SDGs study

Sending out information to the world in English – Grade 6 STEAM study

Exciting and fun to understand digital textbooks

Why was it possible to use ICT with all staff and in all subjects in the school's first year?



● In the first year of the school's operation, there were not many staff members who were knowledgeable of ICT, so we assigned staff members who were to the 3rd and 5th grades.

[Questionnaire Results]

- Many asked a colleague knowledgeable about ICT
- Many teachers consulted within the same grade level (This is important)
- Many teachers also asked school students who are knowledgeable about ICT (this may be unique to our school)

Collegiality and communication are important

Why was it possible to use ICT with all staff and in all subjects in the school's first year?

You don't need to be able to program.

(Example) Grade 4 robot car programming
- No time for teachers to learn programming
- Teachers don't need to learn anything advanced
- After doing it with Grade 4 Class 1 who are good at it, the children then teaches it to their friends in the next class (Grade 4 Class 2)
- The teacher only needs to be able to evaluate each child's activity.

Grade 4, Class 1 → The children teach each other → Grade 4, Class 2 → The children teach each other → Grade 4, Class 3

Why was it possible to use ICT with all staff and in all subjects in the school's first year?

✕ Use by some teachers and grade specific subjects

○ All staff, all grades, all subjects developmentally appropriate use

It is important to have one child, one device environment where anyone can use the most advanced ICT equipment at any time.

Why was it possible to use ICT with all staff and in all subjects in the school's first year?

- It is important for teachers to get along with each other, and to acknowledge and praise each other
- Every teacher has his or her strengths
- Experienced teachers who are good at teaching are good at using ICT
- Japanese teachers are very talented
- They want to do everything they can for the children
- No one is without ambition
- It is okay to fail. Try using it more and more

[Words to each other]
- It's amazing.
- Well done
- You're doing great.
- Tell me how you did it
- She's improved
- Thanks to you, teacher

- Stress checks (support of colleagues)
  National average 8.1
  Midorino Gakuen 10.0 (perfect score)