

## Research on the Educational Effects of Class Size (Outline)

The National Institute for Educational Policy Research conducted research on the educational effects of class size led by Kudo Bunzo, Director of the Department for Elementary and Secondary Education Research, and produced a report on the collated results.

Key points from the research outcome.

- When pupils who had been in a class of 20–21 pupils and moved up to a class of 39 in the next year were asked about differences in the classroom life, more negative points such as more trouble with friends, noisiness, heat, and crowding were raised than benefits. →2(1), Annex1
- It is thought that it was harder for pupils further from the teacher to hear him or her in a class of 40 than in a class of 3. →2(2), Annex2

### 1. Overview of Research

In this study, two working groups were set up: one on learning outcomes and the other on teaching and learning support. The research was conducted to obtain various basic data about the impact of class size on education. This report presents the results obtained by the learning outcomes group, that is, the following two research activities as well as producing visual material.

(1) Pupils' recognition of differences in classroom life involved when class size became larger when moving to the next grade.

In the fourth grade, a class of 39 pupils was made up of children who had been in two classes (of 20 and 21) in third grade. In addition to analyzing the children's opinions (e.g., by means of classroom activities called "reflecting on the first term" (July, Heisei 24/2012)), teachers were interviewed.

(2) Analysis of differences in the way teachers' voices were transmitted in classrooms depending on class size.

A teacher read out a picture story first in an empty classroom and then to classes of 30 and 40 pupils, respectively. S/N (signal to noise) ratio was measured at nine different points in the classroom, and the differences in S/N ratio between the readings were compared (conducted in December, Heisei 24/2012).

(Note) SN ratio (signal to noise ratio) : Differences between the sound pressure level of the signal that you want to hear and other noise (background noise). It is considered that the larger the ratio, the easier you can hear the signal.

(3) Class size photo material (lower secondary school)

We photographed classes of three sizes (about 30, 35, and 40, respectively) for each of the first, second, and third grades in lessons and during breaks and produced photo material showing overhead views of classes.

2. Summary of research results.

(1) Pupils' recognition of differences in classroom life when class sizes expanded when moving to the next grade. **【Annex1】**

- Comparing the number of idea units in free descriptive answers on worksheets from the classroom activity, we found 96 units in which it was thought of as having positive points, and 198 units in which it was thought of having negative points. For each pupil, there were 2.5 units for the former and 5.2 units for the latter, that is, at least twice as many negative units for the combined large class.

**【Main views of pupils】**

- Interaction between themselves: as a benefit, making a lot of friends (42.1%). As a downside, more trouble with friends (39.5%), more children messing about (31.6%), more rowdiness and misbehaviour (15.8%), and so forth.
- Lesson: as a positive point, “a variety of opinions were expressed,” totaling 23.7%. The negative points were that “it was too noisy” (65.8%), “pupils were unable to hear the teacher” (13.2%), “fewer opportunities for presentations and expressing views” (10.5%), “lessons not progressing” (7.9%), and so forth.
- Daily school life: as a positive point, more opportunities for cooperative achievements (26.3%), while as a negative point, they needed to wait a long time for their turn, including for marking of written work (23.7%), cleaning was hard because there were too many tables (13.2%), lunch duty was hard because there were too many pupils (13.2%), and so forth.
- Class environment: There were no benefits raised. Difficulties raised were that it was hot (63.2%) and overcrowded (44.7%).

(2) Analysis of differences in the way teacher's voice was heard in a classroom for different class sizes. **【Annex2】**

- Teacher's voice was thought to be hard to hear because the further away pupils were from the teacher, the smaller was the S/N ratio.
- The degree of decrease in S/N ratio when further away from the teacher was larger in a class of 40 than in a class of 30. Therefore, pupils further away from the teacher were thought to have difficulty hearing him.

(3) Class size photo material (lower secondary school). **【Annex3】**

- We created photo materials so that we can visually consider differences caused by class sizes, that is, in terms of how class space was used and how teachers and children performed in classes.

(Reference)The full text of the report has been published on the website of the National Institute for Educational Policy Research.

- Pupils' recognition of differences in classroom life involved when class size became larger when moving to the next grade.

URL : <http://www.nier.go.jp/shochu/seika/kibo/k-004.pdf>

- Analysis of differences in the way teachers' voices were transmitted in classrooms depending on class size.

URL : <http://www.nier.go.jp/shochu/seika/kibo/k-005.pdf>

- Class size photo material (lower secondary school).

URL : <http://www.nier.go.jp/shochu/seika/kibo/k-007.pdf>

Research on the educational effects of class size by the working group on learning outcomes. The research was carried out in fiscal year Heisei 23-24 (2011-12), led by Bunzo Kudo, Director of the Department for Elementary and Secondary Education Research.

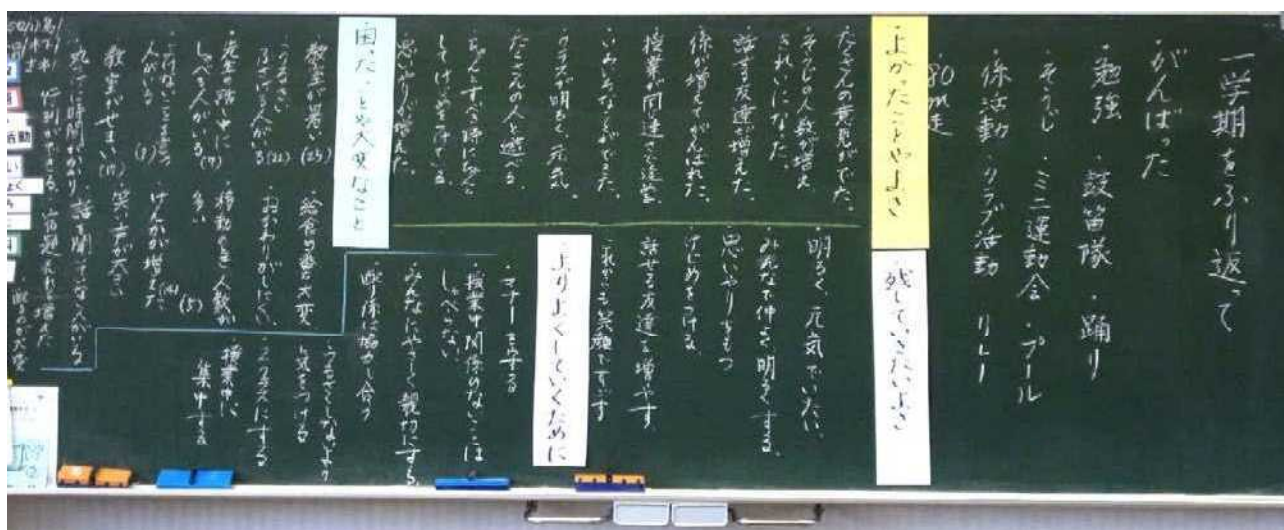
**Pupils' recognition of differences in classroom life involved when class size becomes larger when moving up to the next grade.**  
**Overview of research outcome**

○ Aims and Methods

- The aim is to consider the impact of increase in class size on pupils by summarizing how pupils felt when their class size increased on moving to the next grade.
- In the fourth grade, a class of 39 pupils comprised children who had been in two classes (of 20 and 21, respectively) in third grade because there were 41 pupils. Targeting those 39 pupils, we conducted one lesson classroom activity (45 min) called “Reflecting on the first term” in July Heisei 24 (2012).
- During the activity, while making pupils look back on the first term, we made them write, on their worksheets, and then discuss four points regarding the combined class in the fourth grade and increased the class size: positive points, negative points, points that they want to carry on in the second term as well, and what to do to resolve negative points.
- Everything said by teachers and pupils about the classroom activity was recorded by a shorthand writer and was used for analysis. In addition, because we could not obtain views from all the pupils during the actual activity, we used the worksheets from the activity for the analysis. Furthermore, we interviewed the class teacher.



(The general impression of that day)



## Research on the Educational Effects of Class Size by the Working Group on Learning Outcomes

The research was carried out in fiscal year 2011-12 (Heisei 23-24), led by Bunzo Kudo, Director of the Department for Elementary and Secondary Education Research.

Differences in the way the teacher's voice was heard in a classroom for different class sizes—paying attention to signal-to-noise ratio  
Overview of the research outcome

- Purpose:
  - To test and appraise differences in the way teacher's voice is heard for different class sizes.
  - To do this, a teacher read out a picture story first in empty classrooms and then to classes of 30 and 40 pupils, respectively (picture 1). S/N (signal to noise) ratio<sup>1</sup> was measured at nine points in the classroom: at each of the front, middle, and back rows, on the window side, the middle of the row, and the corridor side. Changes in S/N ratio between the positions were compared.



(Class of 30 pupils)



(Class of 40 pupils)

Picture 1. Classes of 30 and 40 pupils

- Subjects, Conditions, and Methods
  - Research was conducted targeting the three classes (Green, White, and Red classes) in Grade 5 at Takamatu primary school, which is attached to the faculty of education of Kagawa University
  - The arrangements of seats and the positions of teachers and measuring points (the positions of the sound level meters) for the classes of 40 and 30 pupils, respectively, are shown in Diagram 2. The curtains were shut on the window side, that is, the left side of the diagram.

<sup>1</sup> S/N ratio: difference between the sound pressure level of the signal that you want to hear and other noise (background noise). The larger the ratio, the easier it is to hear the signal.

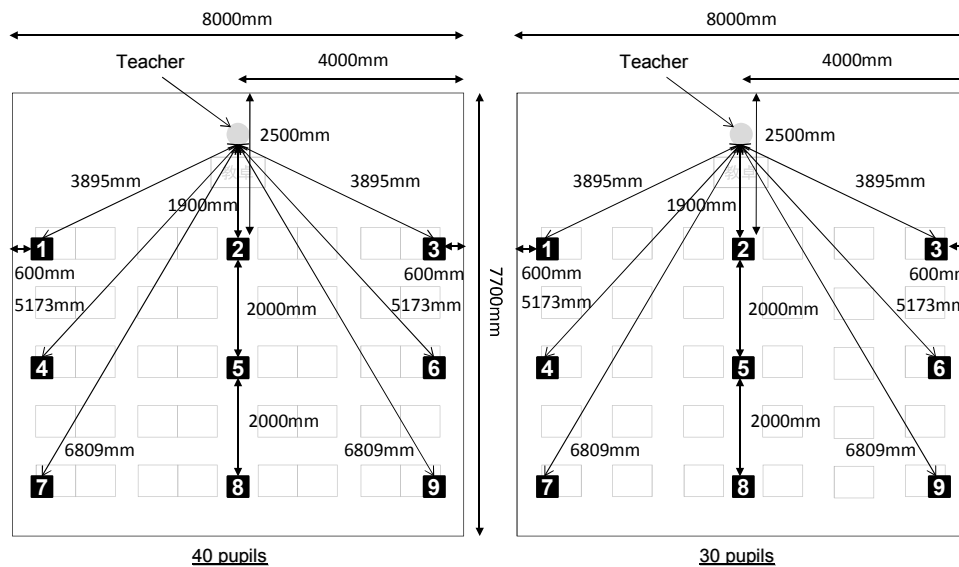


Diagram 2

Positions of the measurement points in the classroom used for the experiment. (■ for sound-level meter. Numbers correspond to the numbering of measurement points).

- We calculated SN ratio for each measurement point in empty (for background noise) classrooms. We measured noise levels in each classroom (with 30 and 40 seats) when empty, for background, and when a teacher read out a story with no pupils present. Furthermore, we calculated S/N ratio for each measurement point in full classrooms by measuring noise levels in each class when full of pupils (30 and 40, respectively), for background, and again when a teacher read out a story.
- For three classes, we divided a session into two halves. We set up the first half with 30 pupils and the second with 40 (one class), and the first half with 40 pupils and the second with 30 (two classes). The total number of Grade 5 pupils in each class was insufficient for the test with 40 in each of the three classes and, therefore, three to seven Grade 4 pupils were added to the 40-pupil classes to make up the numbers.
- “Ghost Tempura,” a big picture book, was read out. Reading was divided into two parts. After the first part, it was briefly stopped and extra pupils were either added (where the first half had 30 pupils and the second half 40) or removed (where the first half had 40 and the second half 30).
- As an index, we used equivalent continuous sound level,<sup>2</sup> each 30 seconds, based on an A-weighted sound pressure level.<sup>3</sup>

<sup>2</sup> Equivalent continuous sound level (Leq): the decibel value, changed from fluctuating noise over a period of time to equivalent steady sound level during the same period. In this study, both the teacher’s voice volume and pupils’ noise were thought to be variable. We used this system to smooth out fluctuations in the noise intensity.

<sup>3</sup> A-weight filter: giving more weight to frequency components at which the human ear is more sensitive.

○ Results

For three classes, we measured the SN ratios at every point while the teacher read to an empty classroom and to classrooms with pupils. These were expressed as SN ratios, and with the middle of the front row (measuring point number 2—facing the teacher directly), used as a standard for comparison. Differences in SN ratio at each measuring point were as illustrated in Diagrams 3–5.

○ Consideration:

- SN ratio in an empty classroom
  - The SN ratio tended to become smaller with increasing distance from the teacher, whether classes had 30 or 40 seats.
  - There was very little difference in this tendency between the classes with 30 and 40 seats in all the three classes.
- SN ratio in a classroom with pupils
  - The finding that the SN ratio decreased with distance from the teacher also applied when students were present.
  - The tendency for SN ratio to decrease with distance from the teacher was more marked when pupils were in the class.
  - When comparing the class with 30 pupils present with that of 40 pupils, there was a more marked tendency for the SN ratio to drop with distance between the teacher and measuring points for the latter, that is, 40 pupils.

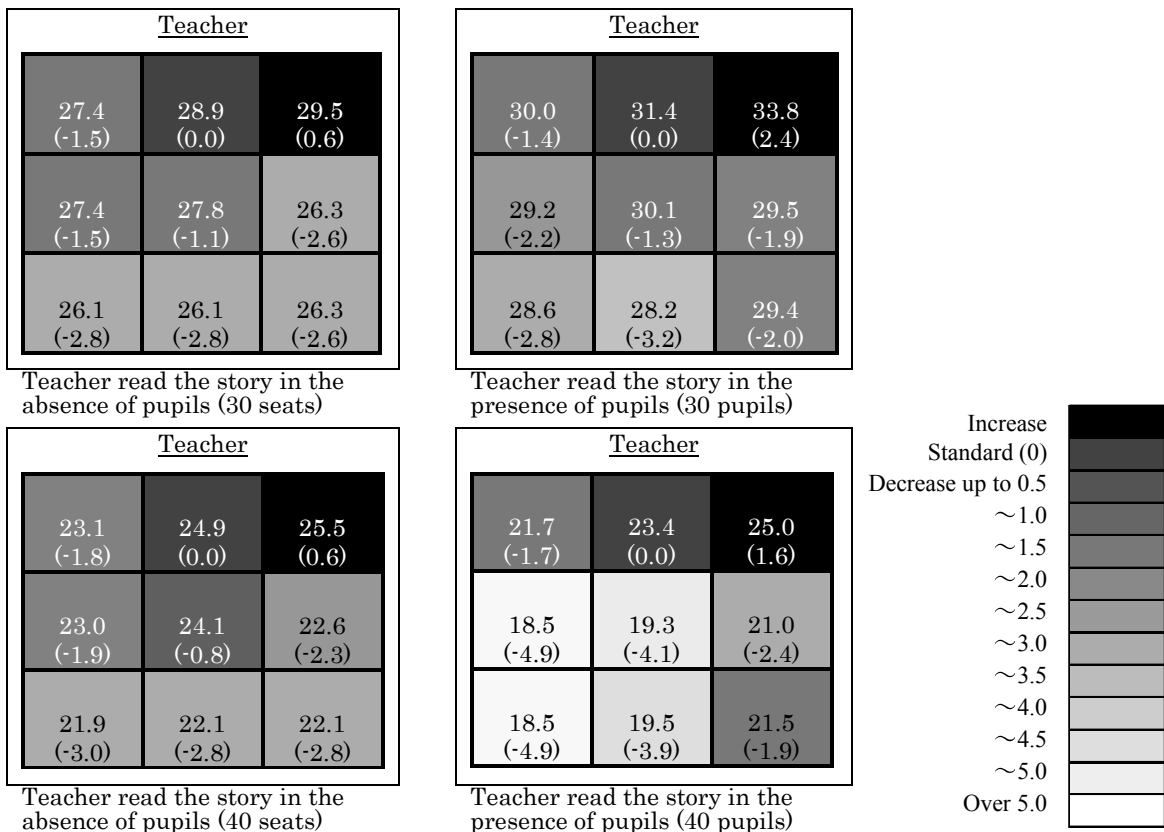


Diagram 3

SN ratio at each measuring point and differences in SN ratios with the middle front point (number 2) as standard (Green class Grade 5)

Teacher		
25.1 (-1.0)	26.1 (0.0)	25.4 (-0.7)
23.2 (-2.9)	24.7 (-1.4)	23.5 (-2.6)
22.7 (-3.4)	21.8 (-4.3)	23.4 (-2.7)

Teacher read the story in the absence of pupils (30 seats)

Teacher		
25.0 (-1.8)	26.8 (0.0)	26.3 (-0.5)
22.8 (-4.0)	25.1 (-1.7)	24.1 (-2.7)
21.8 (-5.0)	22.0 (-4.8)	24.6 (-2.2)

Teacher read the story in the presence of pupils (30 pupils)

Teacher		
26.0 (-0.1)	26.1 (0.0)	26.2 (0.1)
21.9 (-4.2)	24.2 (-1.9)	23.8 (-2.3)
22.3 (-3.8)	21.7 (-4.4)	23.4 (-2.7)

Teacher read the story in the absence of pupils (40 seats)

Teacher		
27.8 (-1.0)	28.8 (0.0)	28.7 (-0.1)
24.6 (-4.2)	25.9 (-2.9)	25.6 (-3.2)
25.1 (-3.7)	22.4 (-6.4)	24.2 (-4.6)

Teacher read the story in the presence of pupils (40 pupils)

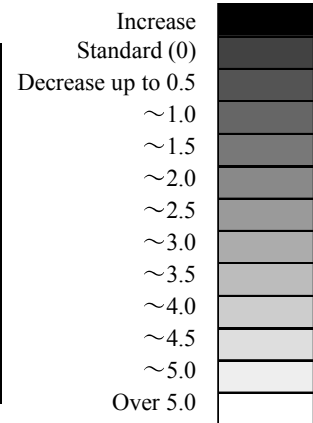


Diagram 4

SN ratio at each measuring point and differences in SN ratios with the middle front point (number 2) as standard (White class Grade 5)

Teacher		
19.3 (-2.1)	21.4 (0.0)	21.8 (0.4)
18.6 (-2.8)	20.4 (-1.0)	18.5 (-2.9)
18.0 (-3.4)	17.5 (-3.9)	18.1 (-3.3)

Teacher read the story in the absence of pupils (30 seats)

Teacher		
20.1 (-1.9)	22.0 (0.0)	21.6 (-0.4)
17.3 (-4.7)	19.6 (-2.4)	17.8 (-4.2)
16.3 (-5.7)	15.8 (-6.2)	17.7 (-4.3)

Teacher read the story in the presence of pupils (30 pupils)

Teacher		
20.8 (-1.6)	22.4 (0.0)	21.4 (-1.0)
18.6 (-3.8)	20.4 (-2.0)	19.5 (-2.9)
18.4 (-4.0)	16.9 (-5.5)	18.8 (-3.6)

Teacher read the story in the absence of pupils (40 seats)

Teacher		
20.3 (-2.3)	22.6 (0.0)	21.3 (-1.3)
17.8 (-4.8)	19.0 (-3.6)	18.1 (-4.5)
16.2 (-6.4)	15.0 (-7.6)	17.3 (-5.3)

Teacher read the story in the presence of pupils (40 pupils)

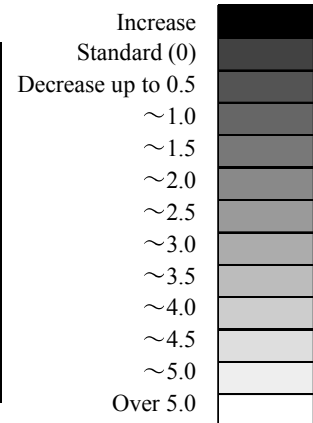


Diagram 5

SN ratio at each measuring point and differences in SN ratios with the middle front point (number 2) as standard (Red class Grade 5)



○ Summary

- SN ratio decreases with distance from the teacher, and the rate of decrease with distance is larger when more pupils are present. This suggests that the larger the class, the higher the proportion of pupils who cannot hear the teacher.

(Writing on the blackboard after the classroom activity)

1 Reflecting on the first term

Tried hard

Study: Fife and Drum Band, Dance

Cleaning, Mini Sports Event, Swimming

Class duties, Club activities, Relay race

80 m race

Positive points:

Many opinions were raised

Cleaner, with more pupils involved in cleaning

More friends to talk to

Working hard by being able to get involved in more classroom duties

Lesson progression at the same pace

Being able to engage in various activities

Class atmosphere has become cheerful and energetic

Being able to play with many pupils

Draw a clear line by working properly when needed

More considerate behavior

Negative points:

Classroom is hot (25)

There are noisy children messing around

There are pupils talking while the teacher is talking

There are pupils engaging in unwanted things

Overcrowding

Need to queue because teacher takes a long time to mark pupils' written work

Lunch duty is hard

Hard to get a second helping

Too many people during transitions (5)

More quarrels and fights

Loud laughs

There are pupils not listening to the teacher

Increase in the number of pupils who did not do homework

Difficulty handing out items

Points that pupils want to carry on with:

Wanting to be cheerful and energetic

Getting on well with others and brightening up the class atmosphere

Being considerate (thinking of others)

Draw a clear line

Make more friends who they can talk to

Smiles from now on

To make things better:

Follow rules of good behavior

Don't talk about irrelevant matters during lessons

Be kind to everyone

Be helpful to those serving lunch

Try not to be noisy

Form two classes

Concentrate on lessons

- Outcomes and points for consideration (centering on free descriptive answers by pupils)
  - Comparing the number of idea units in free descriptive answers on the worksheets from the classroom activity, we found 96 units in which it was of having positive points, and 198 units in which it was of having negative points. For each pupil, 2.5 units for the former and 5.2 units for the latter, that is, at least twice as many negative units for the combined large class were found.
  - Interaction between pupils: as a benefit, making a lot of friends (42.1%); as a downside, more trouble with friends (39.5%), more children fooling around (31.6%), more rowdiness and misbehavior (15.8%), and so on.
  - Lesson: regarding positive points, a variety of opinions were expressed, totaling 23.7%. The negative points were that it was too noisy (65.8%), pupils were unable to hear the teacher (13.2%), fewer opportunities for presentations and expressing views (10.5 %), and lessons not progressing (7.9%).
  - Daily school life: as positive points, being able to do a lot of things such as organizing extracurricular fun activities, being able to work together toward a common target, more opportunities for cooperative achievements, (altogether 26.3%); as negative points, they need to wait a long time for their turn, including marking of written work (23.7%), cleaning hard because there are too many tables (13.2%), lunch duty is hard because there are too many pupils (13.2%), and so on.
  - Class environment: there were no benefits raised. Difficulties raised were: that it is hot (63.2%) and overcrowded (44.7%).

Classification of the free descriptive answers in response to the question “What are the benefits of becoming one class?”

Categories	Frequency (%)
Making many friends	42.1
Being cheerful, fun, energetic and lively	39.5
More opportunities for cooperative achievements	26.3
A variety of opinions expressed	23.7
More considerate behavior	21.1
More class duties	13.2
Being able to clean properly	13.2
Being able to participate in lessons enjoyably but seriously	13.2
Being able to draw a clear line	7.9
The same pace of lesson progression	5.3
Others	10.5

Classification of free description in response to the question “What are the negative points of becoming one class?”

Categories	Frequency (%)
Noisy	65.8
Hot	63.2
Crowded	44.7
More trouble with friends	39.5

More children fooling around	31.6
Needing to wait a long time for their turn	23.7
More rowdiness and misbehavior	15.8
Cleaning is hard because there are so many tables	13.2
Lunch duty is hard	13.2
Unable to hear the teacher	13.2
Few opportunities for expressing views	10.5
Handing out things is difficult	10.5
More children forgetting homework and leaving things at home	10.5
Disagreements	7.9
Lessons progressing less	7.9
Activities taking too much time	7.9
Hard due to change in rules	5.3
Difficulty with transitions	5.3
Dislike fulfilling class duties	5.3
Valuing property less	5.3
Others	26.3

## Research on the Educational Effects of Class Size by the Working Group on Learning Outcomes.

The research was carried out in fiscal year 2011-12 (Heisei 23-24) led by Bunzo Kudo, Director of the Department for Elementary and Secondary Education Research.

### Class size photo material (lower secondary school) Overview

- Purpose and contents
  - We created photo materials so that we could visually consider differences caused by class sizes, in terms of how class space is used and how teachers and children perform in classes.
  - We published altogether 14 photos that show a bird's-eye view of each class. Each scene: each of the three class sizes (about 30, 35, and 40 pupils, respectively), Grades 1, 2, and 3 at lower secondary school, morning classroom activities (two scenes), period 1 (two scenes), 5-min break (1 scene), period 2 (two scenes), 5-min break (one scene), period 3 (two scenes), 5-min break (one scene), period 4 (two scenes), and immediately after period 4 (one scene).
  - We produced photos from videotaped data. We videotaped classroom activity from morning to immediately after period 4.
  
- Examples of photos (social studies lesson)

	Grade 1	Grade 2	Grade 3
About 30 students			
About 35 students			
About 40 students			