

National Institute for Educational Policy Research FY2017-2018 Project Research
“Comprehensive Study on Pre-service Training and In-service Training of Teachers in ‘Next
Generation Schools’ and Strengthening of the Functions of Management”

Research Report

Differences between the Task Engagement Behavior of Children and the Teacher’s Involvement
with the Children in Class Based on Class Size

Summary of the Study

1. Issues

1.1 Task engagement behavior and class size

- Previous studies showed that class participation and task engagement behavior have an impact on the learner’s academic achievements, and that the learner’s participation in class and task engagement behavior are influenced by the size of the class.

1.2 Issues concerning the methods of gauging task engagement behavior

- The methods used in previous research to ascertain task engagement behavior included the questionnaire method and observation method. Of the observation methods, time sampling observation was the most frequently used.

- Even if the questionnaire method uses the same class participation or task engagement behavior, one drawback is that variances may arise in the degree of introspective reporting as well as differences in interpretation of the text between learners. Another drawback is that the time sampling method lacks accuracy over the extent to which the learners in the classroom, who were extracted as subjects of observation, are able to represent other learners, and in that the behavior of the learners, who are not included in the observation unit time, is not recorded.

1.3 Alternative methods to gauge task engagement behavior

- In order to avoid the above problems, one alternative is to have all the participants of a class wear measuring devices, and acquire biological information related to class participation and task engagement behavior. One piece of biological information, which can be acquired using a relatively small measuring device that can be comfortably worn, is the frequency of body movements and this can be measured using an accelerometer. Previous studies have been conducted to gauge the class participation of learners using a sensor with a built-in accelerometer, which had the advantage of being able to record actions throughout the entire class time of all the subject children.

- In previous studies, out of the various movements of elementary school students in class, the frequency of body movements accompanying behavior that was assumed not to be task engagement was shown to be either almost 0 Hz or to exceed 2.5 Hz.

2. Purpose

- The objective of this research is to examine the differences between the task engagement behavior of the children during class based on the class size and the interaction of the teachers with the children for all learners who took the class and for the entire class time.

- The learner groups were organized into 32-33 learners, 20 learners, and 12-13 learners, two hours of experimental lessons were conducted using the same lesson plan for each learner group, and a study was conducted of (1) the differences in the proportion of time that children spent on task engagement behavior out of the entire class time according to the size of the learner group, and (2) differences depending on the size of the learner group in the proportion of children, who received individual instruction from the teacher who walked around class to check for understanding and offer assistance, and the extent of the contribution of factors such as the size of the learner group to the differences in the number of times each child was given such individual instruction.

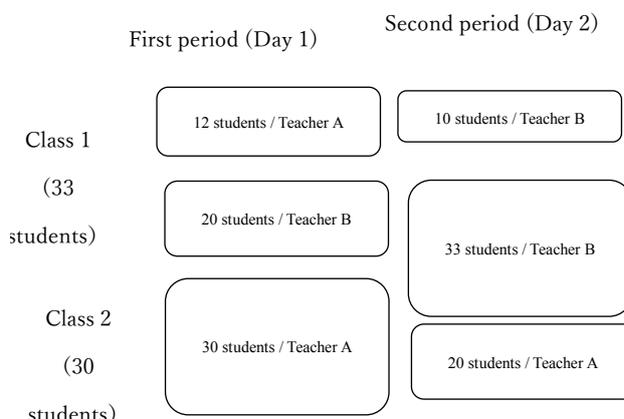


Figure 1. Assignment of the learner group and lesson teacher

3. Methods

- An experimental lesson was taught for two third-grade classes of an elementary school affiliated with the education department of a national university. The target subject was Japanese language. These classes were reorganized as shown in Figure 1, and two teachers whose specialized subject of research was Japanese language taught two hours of lessons over two consecutive days using the same lesson plan.

- Wearable sensors with a built-in 3-axis accelerometer were worn by the students. The body movement accompanying the behavior of the child was gauged using a zero crossing frequency sampled with the resultant acceleration of a 3-axis acceleration at 50 Hz.

- The time where the frequency was at 0Hz was taken as time assumed not to be task engagement

behavior, and adding up the total time, and taking the difference between this total time and the time of the entire lesson to be the time where the students displayed task engagement behavior, the proportion of time that could be assumed to be task engagement behavior against the time of the entire lesson was obtained for each child.

- A video was taken from before the start of the lesson until after the end of the lesson in such a way that all of the children participating in the lesson were shown in the video, which was taken from the front and back of the classroom. From this video data, the number of times each child received individual instruction from the teacher who was walking around the class to check for understanding and offer assistance, was counted.

4. Results

- Table 1 shows the descriptive statistics of the times and proportion of time that the children could be respectively assumed to be engaging in task engagement behavior in the first period and second period of the class. Figure 2 shows the proportion of children by the proportion of time that the children could be assumed to have been engaging in task engagement behavior per class period by learner group size.

Table 1 Descriptive statistics of the time and proportion of time children can be assumed to have been engaged in task engagement behavior during class

Class period	Class	Learner group size	Teacher in charge	Entire class time	Task engagement time				Proportion of task engagement time			
					Average	Standard deviation	Minimum	Maximum	Average	Standard deviation	Minimum	Maximum
First period	1 組	12 人	教師 A	34'20"	20'16"	5'48"	10'43"	28'00"	.590	.169	.312	.816
	1 組	20 人	教師 B	44'30"	23'17"	6'40"	8'30"	33'15"	.520	.150	.191	.747
	2 組	30 人	教師 A	38'18"	24'30"	6'10"	8'15"	32'20"	.640	.161	.215	.844
Second period	2 組	10 人	教師 B	33'03"	19'55"	4'18"	14'35"	25'05"	.603	.130	.441	.759
	2 組	20 人	教師 A	40'05"	23'15"	8'16"	6'50"	34'45"	.580	.206	.170	.867
	1 組	33 人	教師 B	39'48"	18'19"	5'32"	7'13"	28'30"	.460	.139	.181	.716

- The results of estimating a Cramer's coefficient using an MCMC method for the results in Figure 2 show that the proportion of children by proportion of time where the children could be assumed to be engaging in task engagement behavior is somewhat related to class size.

- The results of examining the relationship between the proportion of children who received individual instruction from the teacher who walked around class to check for understanding and offer assistance at least once in each lesson and the size of the learner group through estimating the certainty factor of the ratio difference using the MCMC method show that the larger the size of the learner group, the lower the proportion of children receiving individual instruction.

- The results of adding together the first and second period, and estimating the variance components in order to examine the size of the learner group, the factors of the teacher and the children, and the

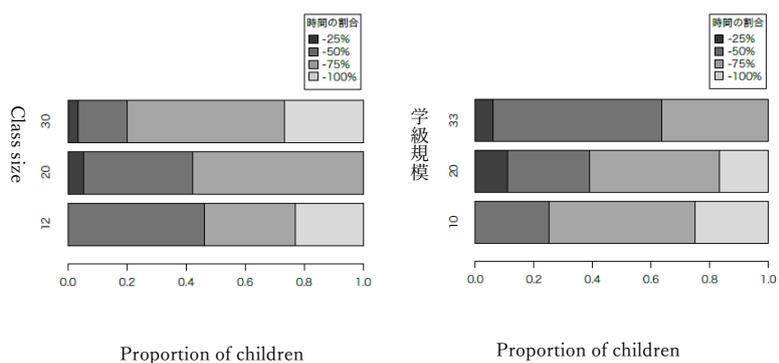
degree of contribution of interactions between them for the variance of the number of times each child received individual instruction show that the number of times a child received individual instruction did not fluctuate greatly (6.0%) depending on differences in the teacher, and the contribution of the class size factor to this variance of the number of times was relatively large (17.8%) .

5. Observations

- There were some children whose learner group size was 20 or more, and the proportion of the time where the child was assumed to be engaged in task engagement behavior to the overall class time was significantly low. This suggests if the size of the learner group or the class size is more than a certain size, there is the possibility that there will be children who barely take any action, including task engagement, during class time.

- This suggests that the proportion of children who receive individual instruction during class and the number of times each child receives individual instruction may also be influenced by the class size.

- The significance of this study is considered to be that by using a method that is not a conventionally used method, it became possible to acquire data throughout the entire class time of all the children participating in the class, and to study differences by class size.



(a) First period

(b) Second period

Figure 2 Differences by learner group size of the proportion of children by the proportion of time the children can be assumed to be engaged in task engagement behavior (by class period)