Effects of Motivation to Engage in Cooperative Learning and Peer Modeling on Perceptions of an Active Participation Structure in a Mixed-Grade Class *

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This study examined the psychological processes that promote active student participation in mixed-grade class activities within the framework of motivation to engage in cooperative learning and peer modeling. A questionnaire survey was conducted among the pupils of an elementary school, in which problem-solving-style mixed-grade class activities were conducted. Path analysis revealed that autonomous motivation to engage in cooperative learning influenced pupil perceptions of the structure of active participation in learning activities. Among third- and fourth-grade children, autonomous motivation to engage in cooperative learning reinforced perceptions of an active participation structure through different-grade peer modeling. Among fifth- and sixth-grade children, controlled motivation to engage in cooperative learning weakened perceptions of an active participation structure. These findings underscore the important role of peer modeling and motivation in mixed-grade learning activities and suggest that the factors that facilitate active participation in mixed-grade class activities may differ across grades.

Key words: mixed-grade class, perceptions of an active participation structure, motivation, peer modeling, elementary school students

1. INTRODUCTION

1.1. Learning activities in mixed-grade classes

In schools, learning activities are emphasized in both same-grade and mixed-grade classes. Many elementary schools create vertically divided groups and offer opportunities for collective engagement in activities (as a form of mixed-grade exchange) to children from different grades. In some schools, especially those in remote areas, mixed-grade classes and learning activities are conducted. During their schooling years, children are afforded several opportunities to interact with both same-grade and different-grade children.

Past studies have investigated the behavioral characteristics that children exhibit during mixed-grade class learning activities. For example, Kariyazono et al. (2004) analyzed the course of intragroup discussions in combined classes (i.e., third- and fourth-grade students). Although fourth graders tended to lead the discussions in the beginning, third graders gradually began to actively participate in the discussions. Okada (2017) observed discussions in a mixed-grade class, which consisted of first- to sixth-grade students. As a class member, each student participated in group activities in a self-regulated manner while paying attention to the perceptions, processes, and motivations of other students.

Past studies have examined student behaviors during mixed-grade class learning activities using observational data. However, few such studies have been conducted, and the relevant literature is insufficient. Notably, no past study has examined the underlying psychological processes among children. Therefore, this study examined the psychological processes that promote active participation in mixed-grade class activities by focusing on student motivation to engage in cooperative learning and peer modeling (i.e., key variables).

1.2. Motivation to engage in cooperative learning

Motivation plays an important role in the learning process. Motivation affects various aspects related to the accomplishment of learning (e.g., academic achievement, learning strategies, and emotions experienced during learning)
Therefore, to understand the process of learning and academic achievement among children, it is necessary to examine the role of motivation.

One theory that focuses on motivation is self-determination theory (Ryan and Deci 2017). This theory distinguishes between different types of motivation based on autonomy. *Intrinsic motivation,* which is characterized by the highest level of autonomy, is a type of motivation that causes an individual to perceive learning as inherently purposeful, interesting, and fun, and to spontaneously engage in learning. *Identified regulation* is a type of motivation that enables an individual to discover his or her personal values, realize the importance of learning contents, and actively engage in learning. It is a type of extrinsic motivation that is characterized by a high level of autonomy. *Introjected regulation,* which is also a type of extrinsic motivation, causes an individual to tackle learning to maintain his or her self-esteem, reduce anxiety, and avoid embarrassment. *External regulation,* which is a type of extrinsic motivation that is characterized by the lowest level of autonomy, is a type of motivation that causes an individual to engage in learning through external reinforcement mechanisms, control-type encouragement, or coercion from others. In several studies, intrinsic motivation and identified regulation have been collectively referred to as *autonomous motivation,* and introjected and external regulation have been referred to as *controlled motivation* (Miserandino 1996, Okada 2018).

Autonomous motivation also plays an important role in cooperative learning. Okada (2014) examined student motivation to participate in cooperative learning from a self-determination perspective. With regard to children learning cooperatively with friends, the researcher identified two types of motivation: autonomous (learning motivated by interest and importance) and controlled motivation (learning motivated by anxiety and external encouragement or pressure). Autonomous motivation also predicts greater engagement in cooperative learning activities in later times (Okada 2018). Thus, even in cooperative learning contexts, autonomous motivation may support child interactions with friends and classmates.

Even during mixed-grade class learning activities, motivation to engage in cooperative learning may influence learning behaviors. Okada (2017) observed discussions in mixed-grade classes and found that, while individual children clarified their class goals, they also tried to mutually increase motivation. Because mixed-grade classes include children who belong to different stages of development, this setup may impede cooperative engagement in learning activities. To proactively participate in various activities under these conditions, children should feel autonomously motivated (i.e., based on interest and importance) toward cooperative involvement and interactions with diverse classmates.

### 1.3. Peer modeling

Peer modeling affects learning in cooperative learning contexts. Modeling refers to cognitive, affective, and behavioral changes that derive from observing other familiar individuals who serve as models (Schunk 2001). Within the classroom, modeling the behaviors of a friend (peer modeling) can significantly improve the motivation levels and actions of a child when he or she engages in different activities.

Peer modeling has been found to influence motivation toward learning. Schunk and Hanson (1985) conducted an experiment among elementary school students and found that self-efficacy and the number of answers provided on a task (which were indicative of motivation) increased when the participants observed same-age peer models than when they did not observe any models or observed adult models. Ito et al. (2013) conducted an experimental arithmetic class among elementary school students and found that they demonstrated greater interest in learning when they observed a model who was interested in the learning contents. These findings suggest that peer modeling enhances motivation.

Children’s motivational trait may also influence peer modeling. The extent to which peer modeling is adopted as a learning strategy differs across pupils (Ohtani et al. 2013). Moreover, Okada (2018) found that autonomous motivation toward cooperative learning is related to subsequent peer modeling. Therefore, peer modeling and motivation share an interactive and a mutually influential relationship. Thus, active participation in learning appears to be promoted by this relationship.

During mixed-grade class learning activities, peer modeling can manifest in different forms. Children are influenced by not only same-grade peer models but also different-grade classmates who engage in the same activities. However, as
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noted by Ohtani et al. (2013), there are individual differences in the extent to which peer modeling is undertaken. The more strongly peer modeling by diverse classmates (same- and different-grade peers) influences a child, the more likely he or she is to actively participate in learning activities conducted among mixed-grade groups.

1.4. The purpose of this study and organization of the paper

This study examined the psychological processes that promote active student participation by focusing on two factors, namely, motivation to engage in cooperative learning and peer modeling. Cooperative learning in mixed-grade class environments is sporadically practiced throughout Japan. However, it can take a variety of forms, and substantial individual variation exists across different schools. In this study, one elementary school, in which cooperative learning in mixed-grade classes was facilitated, served as the field, and I analyzed survey data collected in this environment. With regard to the organization of this paper, I first delineate the characteristics of the field based on my observations of the class to briefly describe the practice of cooperative learning in a mixed-grade class environment. Next, based on analyses of the collected survey data, I delineate the relationships between motivation to engage in cooperative learning, peer modeling, and active participation in mixed-grade class activities.

In this study, active participation was defined as follows: “the extent to which a child perceives a mixed-grade class activity to be something he/she can take an active part in.” As described later, the mixed-grade class activity that was observed in this study was a project-type activity, the direction and contents of which were determined by asking pupils to share their opinions. Active independent participation was encouraged. The pupils were expected to share their ideas during discussions and actively participate in events, field work, and other activities. With regard to educational practice, it is important to ascertain whether pupils perceive the activities conducted in a mixed-grade class environment (i.e., the focus area of this study) as something in which they can actively participate. Therefore, it is important to examine psychological processes such as motivation and peer modeling as factors that influence such perceptions among children. Accordingly, perceptions of an active participation structure were conceptualized in terms of an interest in activity contents, independent participation in discussions, and the perceived contribution of an activity to the project. Further, the effects of motivation toward cooperative learning and peer modeling on this variable were examined.

2. CHARACTERISTICS OF THE FIELD

2.1. Participating school

The participating school was an elementary school that was attached to the Faculty of Education of University “A,” which is a national university corporation located in the Chugoku-Shikoku region in Japan. A total of 608 students were enrolled in this school in the year in which this study was conducted.

2.2. Learning activities of pupils under observation

This study focused on learning activities conducted in mixed-grade classes in the participating school (hereinafter referred to as “Activity B”). For four years after 2013, this school was designated as an experimental school by the Ministry of Education, Culture, Sports, Science and Technology. It was involved in curriculum research and development. An experimental school is allowed to organize and implement curriculums that do not comply with educational guidelines and other regulations. Within this framework, this school has created and adopted a curriculum that consists of two domains: coursework for various subjects and Activity B. In 2017, a special exemption from regular school curriculum rules was granted by the Ministry of Education, Culture, Sports, Science and Technology. Since then, this school has been providing education under a similar curriculum. Activity B was envisioned as a new domain that integrates conventional moral education classes, special activities, and the period for integrated studies. There are two types of Activity B: activities conducted in same-grade classes and activities conducted in mixed-grade classes. This study focused on Activity B conducted in mixed-grade classes.

Activity B was conducted by creating a mixed-grade class that consisted of approximately 34-36 students (five to seven students each from the first to sixth grades). Further, 175 hours per year were assigned for this activity. According to the rules, one class hour (45 minutes) per day should be devoted to this activity from Tuesday to Friday, and such activities are continuously
conducted throughout the year. The pupils participate in problem-solving-type learning tasks called “projects” within the classroom. They also go out into the local community and conduct activities with the support of other entities such as municipalities, trade associations, local theatrical companies, and television stations. The central role of children in discussing the purpose and contents of the project and conducting the activities on their own initiative is emphasized. The aim of Activity B is to foster the qualities, skills, and capacities (through these activities) that enhance one’s ability to study without becoming distracted, demonstrate greater involvement, and exercise creativity. Clean-up activities, stays at lodging camps, and sports days are also conducted, mainly in the same mixed-grade classes. Within the school environment, pupils are encouraged to share a sense of belonging with their mixed-grade class as well as same-grade class.

For four years, the participating institution was as an experimental school. Later, it was formally granted a special exception from the normal school curriculum rules by the Ministry of Education, Culture, Sports, Science and Technology. This school has continued to develop a unique curriculum in which the focus is on cooperating and engaging with others during learning activities within the conventional class environment and in general. Therefore, teachers routinely organize forums to promote interactions among pupils and provide necessary support and guidance. With regard to Activity B, however, teachers assign a substantial proportion of the activities to pupils rather than leading them. For example, children often direct and facilitate discussions in their own preferred style. In most instances, teachers clarify the range of shared opinions (if the discussion becomes deadlocked) or convey the comments of a child to the rest of the class. In some situations, teachers may instruct the class to listen to what the others are saying or ask individual students to deliver a presentation to the entire class. Ultimately, however, the discussions proceed at the children’s own pace.

2.3. Observations of learning activities

In this study, I observed one Activity B class hour (45 minutes) in Class C of the participating school in November 2017. In this class, the pupils were assigned to the project of opening a café that mostly serves local food dishes as a part of the open demonstration lessons, which the school convenes at the end of each school year. Thus, the pupils had been preparing for this event by creating a test menu and items to decorate the café and discussing the kind of local food items that should be offered and the concept based on which the café should be designed.

On the day of observation, I observed the pupils discuss what they should do during Activity B, which had been scheduled for three continuous hours (3-hour Activity B) and conducted several times a year. As per the class format, a 6th grader walked to the front of the class to serve as the moderator and facilitated the discussions while seeking comments from lower-grade pupils. When these discussions were facilitated, this 6th grader, who served as the chairperson of the class (MC) and moderated the session, ensured that each pupil had an opportunity to share his or her ideas. Overall, the pupils wished to conduct the activities as per

<table>
<thead>
<tr>
<th>Table 1. An excerpt from discussion 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1₆: Since this is a discussion between 5th and 6th graders, we’ll do this in such a way that grades 1 to 4 or 1st, 2nd, 3rd, and 4th graders can now make their presentations.</td>
</tr>
<tr>
<td>C1₆: First, talk to those next to you; then, think about what to do based on what they say.</td>
</tr>
<tr>
<td>C1₆: So, 1st to 4th graders will make their presentations first, right? (They discuss for a while.)</td>
</tr>
<tr>
<td>C2₆: Do this in such a way that 1st to 4th graders can make presentations, okay?</td>
</tr>
<tr>
<td>C2₆: Okay, stand up if you have something you want to say.</td>
</tr>
<tr>
<td>C2₆: 1st to 4th graders.</td>
</tr>
<tr>
<td>C2₆: All right, then, why not start with them?</td>
</tr>
<tr>
<td>C2₆: Try to listen to what she says.</td>
</tr>
<tr>
<td>T: Yes, let’s all listen.</td>
</tr>
<tr>
<td>T: 6th graders, please try and listen.</td>
</tr>
<tr>
<td>C3₂: Since we’ll have three hours of Activity B on December 5 and another three hours of Activity B on January 16, I think we should do some part of the activity on December 5 and another activity on January 16.</td>
</tr>
</tbody>
</table>

Note: “C” represents pupils, and “T” represents the teacher. The first numeral that follows “C” indicates the order of pupil remarks, and the second subscript numeral represents the pupil’s grade.
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Activity B allowed the students to conduct activities on their own initiative. In most classes, higher-grade pupils led the class discussions. Sixth graders often played the role of an MC (throughout the year). Fifth graders sometimes played the role of an additional MC, supported the sixth graders, and made follow-up comments when lower-grade pupils voiced their opinions. Higher-grade pupils consciously tried to bring the entire mixed-grade class together, while also presenting their own views and ideas. Irrespective of their grade, the children demonstrated considerable motivation to achieve their project goals, and middle- and lower-grade children also tackled the activities with confidence, shared their own views, and presented their ideas. They had numerous opportunities to witness firsthand their mixed-grade classmates share their views and tackle activities toward goal attainment. Thus, it appears that motivation toward cooperative learning and peer modeling are important factors that support active student participation in a range of activities. At the time of my observation, Activity B was in its 5th year of adoption. Therefore, the children had several years of experience engaging in this activity. Higher-grade children, in particular, had closely observed how their seniors brought the entire mixed-grade class together and led the discussions.

3. INVESTIGATIVE RESEARCH

3.1. Method

3.1.1. Participants

A total of 398 3rd to 6th grade students were recruited from the participating school and asked to answer a questionnaire. The data of 367 pupils whose questionnaires contained no missing values were analyzed. The sample consisted of 93 third graders (47 boys, 46 girls), 90 fourth graders (47 boys, 43 girls), 91 fifth graders (50 boys, 41 girls), and 93 sixth graders (50 boys, 43 girls). There were 18 mixed-grade classes.

3.1.2. Questionnaire

(1) Motivation to engage in cooperative learning: A scale that assesses motivation to engage in cooperative learning (Okada 2014) was used. This scale assesses motivation based on respondent reasons for learning and cooperatively engaging in activities with friends. This scale assesses (a) intrinsic motivation (three items; e.g., “Because I feel happy when things go well as a result of cooperating with my friends”), (b) identified regulation (three items; e.g., “Because it is important to me to study with my friends”), (c) introjected regulation (three items; e.g., “Because I am not confident about studying and engaging in activities independently”), and (d) external regulation (three items; e.g., “Because my teacher asks me to study with my friends”). The question posed by the scale was “Why do you study and engage in various activities with your friends from the same grade and from different grades as a part of Activity B?” Responses were rated on a scale that ranged from 1 (not at all true) to 4 (very true).

(2) Peer modeling: I used the peer modeling scale that has been developed by Okada et al. (2012), but terminologies were modified to make the contents relevant to the activities conducted in the mixed-grade class (four items; e.g., “Am trying to learn and emulate the best things about my friends”). The students were asked to rate each item twice: one rating for same-grade peer modeling and a second rating for different-grade
peer modeling in mixed-grade classes. A four-point scale was used to record their responses (1 = not at all true, 4 = very true).

Perceptions of an active participation structure: To assess perceptions of the structure of active participation in various activities, I used three items extracted from the evaluation questionnaire that the school had already been using: “I enjoy the time I spend on Activity B conducted in a mixed-grade class”; “There is a place where I can actively participate in a mixed-grade class”; and “There is a place where I can present my ideas in a mixed-grade class.” The question was “To what extent does the following apply to you?” A four-point scale was used to record their responses (1 = not at all true, 4 = very true).

3.1.3. Procedure
To assess curricular achievement, the school conducts a questionnaire survey among the pupils twice a year (October and February). This study used the data collected during the questionnaire survey conducted in 2017. In all the classes, the class teachers administered the questionnaire at the same time. The children were informed (both through written documents and orally) that participation was voluntary and that it would not affect their academic records in any way. After they completed the questionnaires, they enclosed them in an envelope and submitted them. To cross-check the data collected across the two time points, the participants were asked to write their names on the questionnaires. However, analysis was conducted after the responses were anonymized.

3.2. Results
3.2.1. Scale characteristics
Using the data collected at Time 1, I conducted exploratory factor analysis (maximum likelihood method) of the scale used to assess motivation to engage in cooperative learning. The eigenvalues attenuated from 4.45 to 2.30, 0.84, 0.75, and 0.68. The Minimum Average Partial correlation (MAP) values were 0.05, 0.03, 0.04, and 0.06 (in this order). The minimum value emerged for the 2-factor solution. Therefore, the number of factors was specified as two, and factor analysis was conducted a second time. The three intrinsic motivation items, the three identified regulation items, and one introjected regulation item strongly loaded onto the first factor. With regard to the second factor, the three external regulation items and two introjected regulation items had strong loadings. In past studies, two higher-order motivational concepts have been identified (Lens and Vansteenkiste 2008, Okada 2010). Intrinsic motivation and identified regulation have been grouped together as “autonomous motivation,” and external regulation and introjected regulation have been grouped together as “controlled motivation” (Miserandino 1996, Okada 2018). Accordingly, in this study, the first factor was called autonomous motivation, and the second factor was called controlled motivation. The item loadings were ≥ 0.40 for only one factor. Alpha coefficients were computed using items with high loadings (subscale items), and they were found to be 0.86 for autonomous motivation and 0.75 for controlled motivation. Similar item groups were created using Time 2 data. The α coefficient was 0.87 for autonomous motivation and 0.74 for controlled motivation. Since the emergent reliability coefficients were acceptable, the sum of the individual item scores served as the scale score.

With regard to peer modeling, the α coefficient was computed for the 4 items that assessed same-grade peer modeling and the 4 items that assessed different-grade peer modeling. Analysis of Time 1 data yielded a coefficient of 0.86 for both same- and different-grade peer modeling. Analysis of Time 2 data yielded a coefficient of 0.84 for same-grade peer modeling and 0.87 for different-grade peer modeling. Because both the subscales demonstrated acceptable reliability, the sum of the four item scores served as the scale score.

The α coefficient that emerged for the three items that assessed perceptions of an active participation structure was 0.88 at Time 1 and 0.87 at Time 2. These values indicated that the scale possessed an acceptable level of reliability. The sum of the three item scores served as the scale score.

3.2.2. Changes in motivation and peer modeling during the school year
To examine changes in motivation to engage in cooperative learning and peer modeling, differences in scores between the two time points were examined (Table 3). There was a significant difference in autonomous motivation ($d = 0.17$, $t (366) = 3.20$, $p < 0.01$). Although the effect size was small, the scores were lower at Time 2 than at Time 1. There were no significant differences in controlled motivation ($d = 0.06$, $t (366) = 1.14$, 0.05).
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3.2.3. Verification of models in which motivation and peer modeling influence perceptions of an active participation structure

I examined the process by which motivation to engage in cooperative learning and peer modeling influence perceptions of an active participation structure. A cross-lagged effects model was used to examine motivation and peer modeling (subscale scores) across the two time points. The model included a path from Time 2 motivation and peer modeling to perceptions of an active participation structure. There were no paths between the motivation subscale scores that differed between the two time points or between the two peer modeling scores. Covariance was assumed to exist among the four subscale scores (motivation and peer modeling at the same time points). With regard to perceptions of an active participation structure, I used the residual scores after scores from Time 1 to Time 2 had been regressively predicted. Moreover, to examine grade differences in the hypothesized relationships, multi-group analysis was conducted using two groups: middle-grade (3rd and 4th graders) and higher-grade students (5th and 6th graders). I created these two groups (each of which consisted of two grades) because the middle and higher grades are consistent with the general classification of school grades. Moreover, during Activity B, it was not only 6th graders but also 5th graders who played the role of an MC and supported lower-grade pupils. Therefore, their classification into middle and higher grades is consistent with conventional practice.

When I divided the pupils into two groups (middle- vs. higher-grade students), I examined grade differences in each study variable. There was a significant difference in autonomous motivation at Time 1 ($\eta^2 = 0.03$, $F(3,363) = 3.69$, $p < 0.05$: 5th graders > 6th graders), same-grade peer modeling at Time 1 ($\eta^2 = 0.05$, $F(3,363) = 6.69$, $p < 0.001$: 5th graders > 3rd graders), and different-grade peer modeling at Time 1 ($\eta^2 = 0.04$, $F(3,363) = 5.35$, $p < 0.01$: 5th graders > 3rd and 6th graders). However, all the effect sizes were small (Cohen 1988). Further, there were few differences between 3rd and 4th graders and between 5th and 6th graders. Therefore, I decided to conduct the analysis using the two aforementioned groups. Table 4 presents summary statistics for each grade.

### Table 4. Summary statistics for the study variables as a function of grade

<table>
<thead>
<tr>
<th>Grade</th>
<th>3rd grade</th>
<th>4th grade</th>
<th>5th grade</th>
<th>6th grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Autonomous motivation</td>
<td>22.89</td>
<td>4.87</td>
<td>23.71</td>
<td>4.13</td>
</tr>
<tr>
<td>Controlled motivation</td>
<td>22.56</td>
<td>4.88</td>
<td>22.72</td>
<td>4.06</td>
</tr>
<tr>
<td>Same-grade peer modeling</td>
<td>11.33</td>
<td>4.04</td>
<td>10.52</td>
<td>3.57</td>
</tr>
<tr>
<td>Different-grade peer modeling</td>
<td>12.56</td>
<td>3.53</td>
<td>13.62</td>
<td>2.63</td>
</tr>
<tr>
<td>Perceptions of an active participation structure</td>
<td>13.17</td>
<td>2.85</td>
<td>13.62</td>
<td>2.27</td>
</tr>
<tr>
<td></td>
<td>12.54</td>
<td>3.53</td>
<td>13.52</td>
<td>2.65</td>
</tr>
<tr>
<td></td>
<td>13.14</td>
<td>3.05</td>
<td>12.80</td>
<td>2.60</td>
</tr>
<tr>
<td></td>
<td>9.45</td>
<td>2.24</td>
<td>9.91</td>
<td>1.96</td>
</tr>
<tr>
<td></td>
<td>9.17</td>
<td>2.69</td>
<td>8.81</td>
<td>2.34</td>
</tr>
</tbody>
</table>

Note: Values presented in the top rows are the results yielded by Time 1 data, whereas the values presented in the bottom row are the results yielded by Time 2 data.
First, I tested a model in which there were no equality constraints on any of the parameters (Model 1). Next, I tested a model in which equality constraints were placed on the covariance between all the paths and variables (Model 2). Model 1 yielded the following fit indices: CFI = 1.00, RMSEA = 0.05, SRMR = 0.03, and BIC = 15979.02. Model 2 yielded the following fit indices: CFI = 0.98, RMSEA = 0.07, SRMR = 0.08, and BIC = 16873.19. Although both models demonstrated acceptable model fit, the difference between the models was significant (Δχ² = 59.51, df = 28, p < 0.001). Therefore, Model 1 was adopted (Fig. 1).

The paths that depicted the autoregression of motivation and peer modeling were significant across both grades. Moreover, the paths from autonomous motivation to same-grade peer modeling and different-grade modeling were significant and positive across both grades.

The path from autonomous motivation to perceptions of an active participation structure was significant and positive across the two grades. Among middle-grade students, there was a significant positive path from different-grade peer modeling to perceptions of an active participation structure. In contrast, among higher-grade students, there was a significant negative path from controlled motivation to perceptions of an active participation structure.

4. DISCUSSION

4.1. Present findings
This study aimed to identify the psychological processes that promote active student participation in mixed-grade class activities. An elementary school that conducted such activities in mixed-grade classes served as the field, and I examined the relationship between motivation to engage in cooperative learning, peer modeling, and perceptions of an active participation structure. Before delineating the emergent relationships between the study variables, I wish to discuss the observed differences in average scores. First, although the effect size that emerged for autonomous motivation was small, the scores had decreased from Time 1 to Time 2. Whereas Time 1 was a period during which Activity B projects had begun to evolve more concretely, Time 2 was a period that immediately preceded the attainment of the ultimate project goal. At Time 2, the participants were temporally closer to the anticipated events, and classes had come to an end. Therefore, it may have been somewhat difficult for the students to experience “the fun
and joy of engaging in such activities.” Thus, their autonomous motivation scores may have decreased (temporarily).

With regard to grade differences, 5th graders obtained slightly higher autonomous motivation scores than 6th graders at Time 1. In the middle of the school year, 5th graders (together with 6th graders) adopted the role of organizing the activities undertaken by the mixed-grade class. Therefore, they are likely to have derived greater joy and pleasure from their interactions with their classmates than their 6th grade counterparts, who demonstrated leadership within their class.

Similarly, 5th graders tended to obtain high peer modeling scores. Same-grade peer modeling scores were higher among 5th graders than among 3rd graders. As children transition to higher grades during the elementary school years, they increasingly tend to make social comparisons and acquire the ability to evaluate themselves more accurately (Toyama 2001). Fifth graders who took on the responsibility of managing their class during Activity B may have adopted peer modeling and imitated the habits and behaviors of other 5th graders who served as models. In the same manner, at Time 1 (i.e., the middle of the school year), 5th graders engaged in different-grade peer modeling to a greater extent than 3rd and 6th graders. To effectively manage their class, 5th graders may have looked up to 6th graders as models.

Based on the aforementioned differences in average scores, I examined the process by which motivation and peer modeling influence perceptions of an active participation structure. With regard to the relationship between motivation to engage in cooperative learning and peer modeling, autonomous motivation at Time 1 was related to same- and different-grade peer modeling at Time 2 among both middle- and higher-grade students. Children who recognized the interest and importance of interacting with mixed-grade classmates may perceive this activity (i.e., undertaking this project while also cooperating with classmates) as one in which they can actively participate, irrespective of their grade. This finding is consistent with the results of a study in which autonomous motivation to learn was related to engagement (Miserandino 1996, Patrick et al. 1993). Similarly, autonomous motivation appears to be an important factor that facilitates engagement in learning activities conducted in mixed-grade groups.

Analyses of the models yielded results that differed between middle- and higher-grade students. Among middle-grade students, different-grade peer modeling was positively related to perceptions of an active participation structure. Middle-grade children, who often play the role of followers in mixed-grade classes, may believe that, by interacting with different-grade Table 5. Excerpt from discussion 3

C16: Okay, then, what shall we do with the 3-hour Activity B?

(Omitted contents)

C25: I think we should make Manga Gourmet food.
T: Wait a minute! Are you listening properly?
T: When you want to speak up, stand up and talk to all of us, alright?
C16: Tell us your reasons too, okay?
C25: The reason is that I think it will be a good practice for things we will eventually be preparing.

(Omitted contents)

C32: I’m for the anmochi-zōni and lemon cider that we’ll be making on the day of the event. I think anmochi-zōni is a good choice. The reason is that I think I still have not learned how to make anmochi-zōni.

(Omitted contents)

C44: I think anmochi-zōni is good.
C44: That’s because we will be making anmochi-zōni for the study group meeting.

Note: ‘C’ represents the pupils. The first numeral indicates the order of pupil remarks, and the second subscript numeral represents the pupil’s grade.

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...classmates, who try to contribute to the activity, they can also participate actively (e.g., by sharing their ideas about a project or taking the initiative to play a specific role). In Class C, exchanges such as those described in Table 5 were observed. In one instance, a 6th grade student, who was serving as the MC, instructed other children to state the reasons that underlay their opinions (when they shared them). In response, a 5th grade pupil shared his/her opinion and provided a reason, following which 2nd and 4th grade children imitated this behavior pattern (i.e., stated their views and provided reasons). As illustrated by these exchanges (i.e., how higher-grade pupils shared their opinions), middle- and lower-grade pupils modeled the speaking behaviors of older children and actively participated in the class activities.

In contrast, among higher-grade pupils, different-grade peer modeling was unrelated to perceptions of an active participation structure. Higher-grade students are often asked to play the role of a leader who manages the class or lead an activity. As shown in Table 6, a 6th grader who served as an MC underscored the need for discussions while imagining what the lower- and middle-grade pupils must be feeling. While sharing his/her opinion, a 5th grader noticed that a 2nd grader was raising his/her hand and tried to encourage him/her to speak up, as if to comply with the suggestion provided by the 6th grader, who was serving as the MC. This allowed the 2nd grader to actively participate in the discussions. As shown in Table 1, although higher-grade pupils sometimes provided their own ideas for the project, they often allowed middle- and lower-grade students to express their opinions and enrich class discussions as a whole. Therefore, even though they may have been inspired by different-grade peer models, this did not influence their participation (i.e., by encouraging them to express their own ideas) and was unrelated to perceptions of an active participation structure.

Among higher-grade pupils, their high levels of controlled motivation were negatively correlated with perceptions of an active participation structure. Studies based on self-determination theory have found that high levels of controlled motivation are related to poor engagement and sustainability and the avoidance of requests for assistance (Patrick et al. 1993, Shih 2009, Vansteenkiste et al. 2009). In this study, such negative effects of controlled motivation were observed among higher-grade pupils but not middle-grade pupils. This difference also appears to reflect differences in the roles that they play within a mixed-grade class. Higher-grade pupils are expected to lead activities while managing their class and to be acutely aware of the need for autonomous and proactive participation. In doing so, when they become keenly aware of extrinsic factors (e.g., a sense of obligation that they must interact with mixed-grade classmates or coercive pressures to manage the class), they may no longer perceive the activity as one in which they can actively participate. Middle-grade pupils often play the role of followers within a class. Therefore, the number of domains within which they receive instructions from higher-grade pupils is relatively higher. Therefore, controlled motivation may not have influenced their perceptions of an active participation structure. Instead, only autonomous motivation had a significant effect.

With regard to relationships among the study variables, autonomous motivation promoted same- and different-grade peer modeling. In addition, among middle-grade students, active participation in activities may have been promoted by different-grade peer modeling, which was enhanced by autonomous motivation. Among higher-grade students, their high levels of controlled motivation throughout the year may have suppressed their energetic participation in activities. These findings suggest that the psychological processes that support active participation in mixed-grade class activities differ

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Table 6. Excerpt from discussion 4

| C1: | Children from 2nd grade to 4th grade do not necessarily agree with that; so, I think it's better to begin the discussions right away. (Omitted contents) |
| C2: | This has already been decided, and, besides, although a majority of people supported Manga Gourmet food when we first made the decision, we may not actually be able to make it, since we have a lot of other things that will occupy us from now on, although I personally think that Manga Gourmet food is better than annochi-zōni. |
| C2: | Look! People are raising their hands. |
| C2: | Look! A 2nd grader is raising her hand. (Omitted contents) |
| C1: | We have only two more months; so, I think we should focus on the real tasks and not do Manga Gourmet food or things like that. |

Note: *C* represents the pupils. The first numeral indicates the order of pupil remarks, and the second subscript numeral represents the pupil's grade.
across grades.

4.2. Suggestions for educational practice

In many schools, learning activities are conducted in mixed–grade class setups. The present findings offer several suggestions regarding this practice.

First, assistance may be required to enhance autonomous motivation to learn cooperatively with diverse classmates within mixed–grade groups. Among both middle– and higher–grade students, I observed a process that originated with autonomous motivation and influenced perceptions of an active participation structure. Since controlled motivation was related to perceptions of such a structure among higher–grade pupils, it is necessary to ensure that they do not experience a strong sense of obligation to interact with classmates in a mixed–grade class or feel pressurized to manage the class.

Autonomy support is a type of teacher assistance that suppresses controlled motivation and enhances autonomous motivation. Autonomy support involves the following: providing instructions and assistance or support, taking the perspectives of pupils who are being managed, and encouraging their choice and spontaneity (Deci and Ryan 1987). Similarly, with regard to mixed–grade class activities, involvement strategies that promote autonomous engagement among pupils should be adopted. In particular, it is important for teachers to support a higher–grade student who is required to manage the class while also acknowledging his or her leadership style (e.g., how they facilitate discussions and summarize opinions). Devising different strategies to promote student involvement from an autonomy support perspective may be effective in promoting active measures to support mixed–grade class learning activities.

Moreover, it is important to provide middle–grade pupils with peer modeling opportunities. Different–grade peer modeling promoted active participation in activities among middle–grade pupils but not among higher–grade pupils. Although pupils routinely have opportunities to observe and appreciate each other’s activities, there are considerable individual differences in how keenly they observe their classmates and try to modify their own behavior based on what they observe. The role of a teacher is to clearly convey what is exemplary in other pupils’ behaviors and remarks, even in mixed–grade groups.

Attention must be paid to the fact that these processes were examined using paper–and–pen questionnaire data. Thus, they may not accurately depict pupils’ actual behaviors. Because motivation to engage in cooperative learning and peer modeling (i.e., factors that facilitate active participation) are covert psychological processes, it is difficult to examine them as clearly as overt actions and behaviors. However, by tracking changes in the contents of pupil utterances, one can identify instances in which such changes in motivation and peer modeling are apparent. With regard to active participation, one can standardize actions and behaviors during discussions and assess (based on a scenario) how a pupil behaves and comments during Activity B events. To gain a more comprehensive understanding of the use of assessments in practice, it is necessary to examine utterances, actions/behaviors, and other indicators related to motivation toward cooperative learning, peer modeling, and active participation.

4.3. Limitations of this study, future directions, and challenges

This study has four limitations and shortcomings. First, this study focused on a specific activity conducted in one school. An elementary school attached to a national university corporation served as the field of investigation, and a learning activity that is not included in regular curriculums was the focus of the present analysis. Further, this activity was conducted among mixed–grade groups, which included first to sixth grade students. Therefore, there are considerable limitations regarding the generalizability of the present findings. There is a need to investigate diverse case examples such as learning activities in regular curriculum and mixed–grade groups of students who represent a narrower grade range.

Second, the present investigation into the psychological processes that are involved in the mixed–grade class learning activity was confined to one specific aspect. Based on the characteristics of the learning activity examined in this study, I inferred that motivation to engage in cooperative learning and peer modeling are important factors that influence perceptions of the structure of active participation in learning activities. However, an infinite number of factors influence active participation during mixed–grade class learning activities (e.g., peer relationships and class goals). There is a need to explore the psychological processes that facilitate active student participation in mixed–grade class learning
activities from more diverse perspectives.

Third, the objects of peer modeling were not specified. In this study, I did not ascertain whether the objects of different-grade peer modeling belonged to a higher or lower grade than the participant. Given the characteristics of Activity B, it is possible that the students were inspired by listening to the ideas of lower-grade pupils or observing them participate in events and other activities. However, because I posed my questions after the targets were grouped together as mixed-grade classmates, I could not determine the extent to which the participants were actually influenced by higher- and lower-grade students. Therefore, future studies should examine the mechanisms that underlie different-grade peer modeling by differentiating between pupils who belong to higher and lower grades (i.e., when compared to the participant).

Fourth, teacher support and assistance were not assessed. This study focused on interactions between pupils, motivation, and peer modeling. However, guidance from teachers may mediate (to a great extent) pupil interactions and influence the measures that are adopted as a part of the activities. To generate ideas and suggestions for future practice, the role of teacher support should be further investigated.

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