

Chapter 5

STUDENTS' PHYSICAL ACTIVITY LEVEL (PAL), STUDENTS' LEARNING BEHAVIOR (LB), AND STUDENTS' FORMATIVE CLASS EVALUATION (FCE) DURING GYMNASTICS UNIT OF ELEMENTARY SCHOOL PHYSICAL EDUCATION (EL-PE) CLASSES FOR 2nd AND 3rd GRADERS

5.1. Purpose

The purposes of the third phase study were:

- (1) To describe the students' physical activity level (PAL) measured using direct observation and Lifecorder during gymnastics unit of PE classes for 2nd and 3rd graders;
- (2) To describe the students' formative class evaluation (FCE) score towards their PE classes during the gymnastics units;
- (3) To describe the students' learning behavior (LB) during motor learning (A2) episodes of the gymnastics units; and
- (4) To clarify the relationships among students' PAL, students' LB, and students' FCE variables during the gymnastics units.

5.2. Methods

5.2.1. Subjects

The subject of this study was 24 PE lessons from 4 gymnastics units for 2nd and 3rd graders. The three units for 2nd graders were observed from May 14th to June 1st 2004 from H elementary school in Ibaraki Prefecture

(Japan) and the other one unit for 3rd graders was observed from June 10th to June 21st 2004 from Z elementary schools in Saitama Prefecture (Japan).

5.2.2. Observation of students' moderate to vigorous physical activity level (MV-PAL)

In this study, McKenzie's five PAL categories (lying down, sitting, standing, walking, and very active) was used for coding only a student every interval for categorizing 4 selected students' PAL by using academic learning time (ALT) observation format. For deciding level of engagement in each PAL categories, we decided each student's PAL based on his or her dominant PAL category inside the 6 second-interval of observed data.

5.2.3. Measurement of students' physical activity level (PAL) by using pedometer

During the 6 hour continual PE lessons, students' physical activity levels were recorded using Lifecorder (pedometer). Twenty three Lifecorder were used for measuring the PAL of randomly selected students. The Lifecorder data of students who continuously present in their PE classes were included in counting the average of PAL of the class. Before measuring the students' PAL and videotaping the students-teacher behaviors, the time setting of each Lifecorder and the time setting on video camera was to be setting up so that the time of both types of machine were agreed. As a result, it was easier to trace teacher or students behaviors by using the recorded real time that automatically recorded in

form of (hh:mm:ss) PM or AM in every episodes and matched with the Lifecorder data from individual students.

5.2.4. Measuring students' formative class evaluation (FCE)

The students' formative class evaluation (FCE) method standardized by Takahashi et al. (1994) and Hasegawa et al. (1995) has been employed as a means for understanding the effectiveness of the physical education classes from students' viewpoint. This method consists of 9 items questionnaire in 4 dimensions: outcomes, volition and interest, way of learning, and cooperation. All the students were given and completed the questionnaire immediately after the physical education class. Response options consisted of yes, neutral, and no. Three points were given to yes, 2 points to neutral, and 1 point to no. The individual point was the average points from the 9 items, and the class points was the average points from class participants.

5.2.5. Measuring students' learning behaviors (LB)

For measuring learning behavior, observed student's learning behavior during 6 second-interval inside A2 episodes was judged by using 6 categories developed by Fukugasako et al. (2003). The six categories were: engage directly in motor learning, engage in-directly to motor learning, engage in cognitive learning, engage in supporting other's learning, waiting or transport to the next task station, and engage in off-task behaviors.

5.2.6. Reliability of data

In order to gain reliable data, trainings based on S-I method (Metzler, 1983) were repeated to ensure observer-reliability of the 2 observers reached more than 80%. Reliabilities of 90% or more were obtained in all the categories of all the observation methods.

5.2.7. Data analysis

Using SPSS 10.0 for windows, average data from all class members and from 4 selected students were counted. For eliminating the effect of absent students toward the average value, average data for each class was counted only from students who always wore Lifecorder and present in their PE classes from the first lesson until the end lesson of the unit. Correlation among variables and comparison of mean were also counted by using the SPSS 10.0 for windows.

5.3. Results

5.3.1. Proportion of each lesson's context categories

In general, as shown in table 5-1 part E on page 59, the 22 lessons has averagely: (1) 38.6 ± 10.0 % of motor learning (A2) episode; (2) 00.0 ± 0.0 % of cognitive learning (A1) episode; (3) 30.5 ± 6.9 % of instruction (I) episode; and (4) 28.0 ± 7.7 % of management (M) episode. Compared to the other classes, the gymnastics unit for grade 3-1 has highest proportion of A2 episodes (46.4 ± 9.7 %), but has lowest proportion of I (26.3 ± 5.2 %) and M (24.9 ± 2.9 %) episodes.

Table 5-1: Average and standard deviation of each variable measured in 4 gymnastics units of elementary school PE classes for 2nd and 3rd graders

| Variable | Grade 2-1 | | Grade 2-2 | | Grade 2-3 | | Grade 3-1 | | Total | |
|---|-------------|------|-------------|------|-------------|------|-------------|------|--------------|------|
| | M | SD | M | SD | M | SD | M | SD | M | SD |
| A FCE (class) | | | | | | | | | | |
| Total Score | 2.77 | 0.02 | 2.78 | 0.13 | 2.75 | 0.05 | 2.68 | 0.06 | 2.74 | 0.08 |
| Products | 2.47 | 0.03 | 2.57 | 0.32 | 2.60 | 0.05 | 2.57 | 0.07 | 2.55 | 0.15 |
| 1. Impressive experience | 2.06 | 0.12 | 2.45 | 0.60 | 2.46 | 0.14 | 2.50 | 0.18 | 2.38 | 0.34 |
| 2. Skill | 2.87 | 0.10 | 2.77 | 0.19 | 2.71 | 0.14 | 2.60 | 0.10 | 2.74 | 0.16 |
| 3. Knowledge | 2.46 | 0.10 | 2.62 | 0.14 | 2.51 | 0.07 | 2.51 | 0.09 | 2.57 | 0.17 |
| Volition and interest | 3.00 | 0.00 | 2.99 | 0.01 | 2.98 | 0.03 | 2.88 | 0.02 | 2.95 | 0.05 |
| 4. Doing one's best | 3.00 | 0.00 | 2.98 | 0.02 | 2.95 | 0.03 | 2.78 | 0.05 | 2.92 | 0.09 |
| 5. Fun | 3.00 | 0.00 | 3.00 | 0.00 | 2.96 | 0.05 | 2.98 | 0.02 | 2.98 | 0.03 |
| Way of learning | 2.88 | 0.08 | 2.73 | 0.13 | 2.82 | 0.02 | 2.77 | 0.02 | 2.80 | 0.09 |
| 6. Spontaneous learning | 2.84 | 0.13 | 2.74 | 0.12 | 2.81 | 0.06 | 2.79 | 0.04 | 2.80 | 0.10 |
| 7. Learning for own goal | 2.92 | 0.08 | 2.72 | 0.19 | 2.82 | 0.07 | 2.76 | 0.04 | 2.81 | 0.12 |
| Cooperation | 2.88 | 0.08 | 2.78 | 0.07 | 2.76 | 0.11 | 2.62 | 0.12 | 2.76 | 0.13 |
| 8. Friendly manner | 2.95 | 0.06 | 2.87 | 0.09 | 2.80 | 0.13 | 2.80 | 0.11 | 2.86 | 0.11 |
| 9. Cooperative learning | 2.60 | 0.09 | 2.68 | 0.08 | 2.72 | 0.13 | 2.43 | 0.18 | 2.66 | 0.19 |
| B FCE (sample) | | | | | | | | | | |
| Total Score | 2.79 | 0.05 | 2.70 | 0.15 | 2.80 | 0.06 | 2.71 | 0.10 | 2.75 | 0.10 |
| Products | 2.58 | 0.07 | 2.73 | 0.29 | 2.63 | 0.19 | 2.68 | 0.17 | 2.65 | 0.18 |
| Volition and interest | 3.00 | 0.00 | 3.00 | 0.00 | 3.00 | 0.00 | 2.91 | 0.06 | 2.97 | 0.04 |
| Way of learning | 2.83 | 0.20 | 2.47 | 0.28 | 2.92 | 0.11 | 2.68 | 0.13 | 2.73 | 0.24 |
| Cooperation | 2.87 | 0.07 | 2.57 | 0.16 | 2.72 | 0.18 | 2.60 | 0.14 | 2.69 | 0.18 |
| C PAL (Number of steps) | | | | | | | | | | |
| Class average | 2134 | 731 | 2104 | 619 | 2087 | 496 | 2241 | 478 | 2146 | 552 |
| Sample average | 2183 | 791 | 2041 | 673 | 2235 | 415 | 2113 | 333 | 2143 | 547 |
| D PAL (Intensity of PA) | | | | | | | | | | |
| Class average | 1.88 | 0.55 | 1.75 | 0.41 | 1.77 | 0.27 | 2.12 | 0.35 | 1.89 | 0.41 |
| Sample average | 1.94 | 0.62 | 1.71 | 0.44 | 2.18 | 0.41 | 2.03 | 0.23 | 1.97 | 0.45 |
| E Proportion of Lesson Context | | | | | | | | | | |
| A2 (Motor learning) | 36.9 | 10.7 | 31.8 | 9.1 | 38.1 | 5.5 | 46.4 | 9.7 | 38.6 | 10.0 |
| A1 (Cognitive learning) | 00.0 | 0.0 | 00.0 | 0.0 | 00.0 | 0.0 | 00.0 | 0.0 | 00.0 | 0.0 |
| I (Instruction) | 31.1 | 8.4 | 32.1 | 6.5 | 33.2 | 6.7 | 26.3 | 5.2 | 30.5 | 6.9 |
| M (Management) | 25.3 | 3.5 | 36.0 | 7.8 | 26.8 | 10.7 | 24.9 | 2.9 | 28.0 | 7.7 |
| F Maximum involvement rate (MIR) | 48.2 | 10.5 | 43.5 | 5.4 | 59.0 | 11.3 | 53.9 | 7.9 | 51.1 | 10.2 |
| G Proportion of MV-PAL (sample) | | | | | | | | | | |
| MV-PA in A2 | 74.3 | 7.5 | 70.4 | 15.5 | 80.2 | 4.6 | 64.9 | 8.7 | 72.2 | 10.7 |
| MV-PA for Learning | 54.9 | 10.6 | 52.2 | 8.8 | 62.3 | 16.2 | 52.2 | 8.9 | 55.2 | 11.3 |
| MV-PA for Non-learning | 19.3 | 10.7 | 18.2 | 9.4 | 17.8 | 12.5 | 12.6 | 5.0 | 16.9 | 9.3 |
| H Learning behavior (sample) | | | | | | | | | | |
| Engage in learning | 62.2 | 9.7 | 58.5 | 4.2 | 65.1 | 18.6 | 63.9 | 12.4 | 62.6 | 11.6 |
| Directly to motor learning | 51.4 | 11.3 | 48.8 | 7.0 | 60.0 | 17.5 | 50.3 | 10.3 | 52.5 | 11.9 |
| Indirectly to motor learning | 00.0 | 0.0 | 00.0 | 0.0 | 00.0 | 0.0 | 00.0 | 0.0 | 00.0 | 0.0 |
| Cognitive learning | 0.1 | 0.3 | 00.0 | 0.0 | 0.2 | 0.5 | 6.7 | 10.8 | 1.9 | 6.1 |
| Supportive learning | 10.9 | 7.7 | 9.6 | 4.5 | 4.8 | 2.2 | 6.8 | 4.8 | 8.1 | 5.5 |
| Non-learning engagement | 37.3 | 9.7 | 41.4 | 4.2 | 34.8 | 18.6 | 37.1 | 10.5 | 37.6 | 11.1 |
| Waiting/transport | 37.2 | 9.7 | 40.7 | 3.7 | 33.8 | 17.6 | 33.1 | 9.2 | 36.1 | 10.6 |
| Off-task | 0.1 | 0.3 | 0.6 | 1.0 | 1.0 | 1.5 | 4.0 | 3.9 | 1.5 | 2.6 |
| | N=6 lessons | | N=5 lessons | | N=5 lessons | | N=6 lessons | | N=22 lessons | |

In contrast, the gymnastics unit for grade 2-2 has the highest proportion of M (36.0 ± 7.8 %) episodes, and has the lowest average proportion of A2 (31.8 ± 9.1 %) episodes. The highest average proportion of I episodes was found in gymnastics unit for grade 2-3 (33.2 ± 6.7 %). Proportion of lesson

context categories inside of each unit could be seen in figure 5-1, 5-2, 5-3, and 5-4.

Fig. 5-1: Proportion of lesson contexts in gymnastic unit for grade 2-1

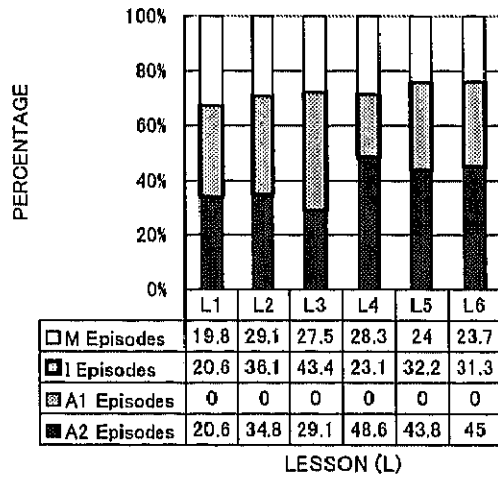


Fig. 5-2: Proportion of lesson contexts in gymnastic unit for grade 2-2

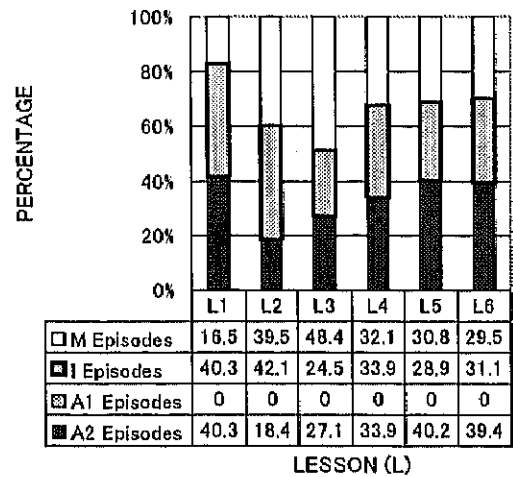


Fig. 5-3: Proportion of lesson contexts in gymnastic unit for grade 2-3

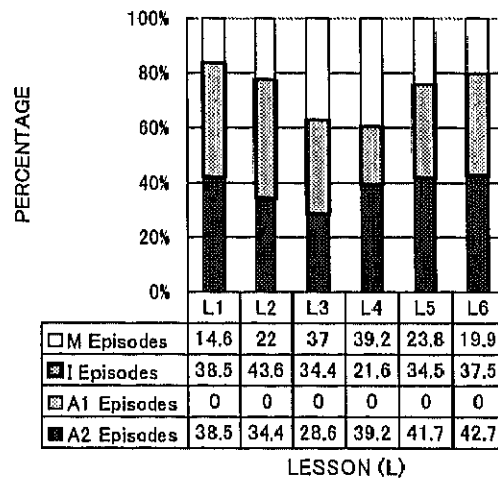
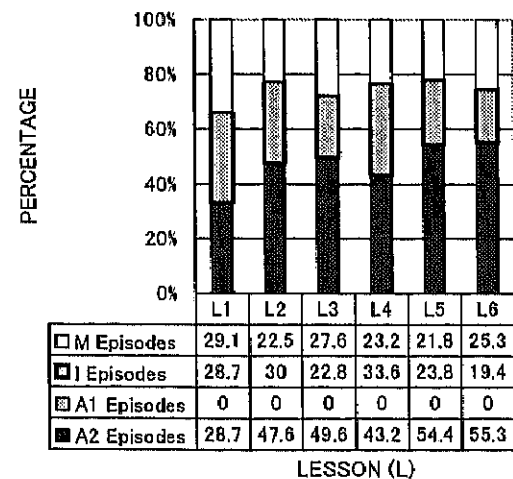


Fig. 5-4: Proportion of lesson contexts in gymnastic unit for grade 3-1



5.3.2. Proportion of maximum involvement rate (MIR)

In general, as shown in table 5-1 part F on page 59, the 22 lessons has averagely 51.1 ± 10.2 % of maximum involvement rate (MIR). Compared to the other classes, the gymnastics unit for grade 2-3 has highest

proportion of MIR (59.0 ± 11.3 %) and in contrast, the gymnastics unit for grade 2-2 has the lowest average proportion of MIR (43.5 ± 5.4 %). Proportion of MIR inside of each unit could be seen in figure 5-5, 5-6, 5-7, and 5-8.

Fig. 5-5: Proportion of maximum involvement rate (MIR) during A2 episode in gymnastics unit for grade 2-1

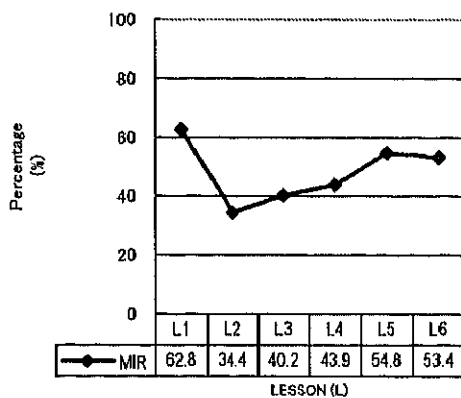


Fig. 5-6: Proportion of maximum involvement rate (MIR) during A2 episode in gymnastics unit for grade 2-2

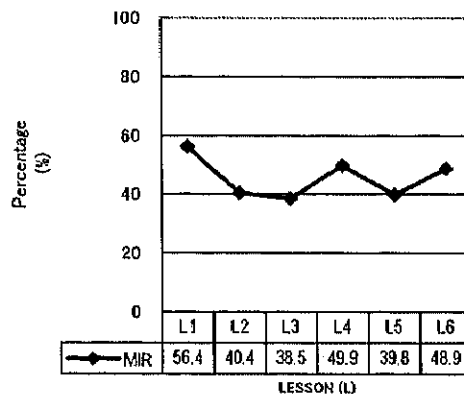


Fig. 5-7: Proportion of maximum involvement rate (MIR) during A2 episode in gymnastics unit for grade 2-3

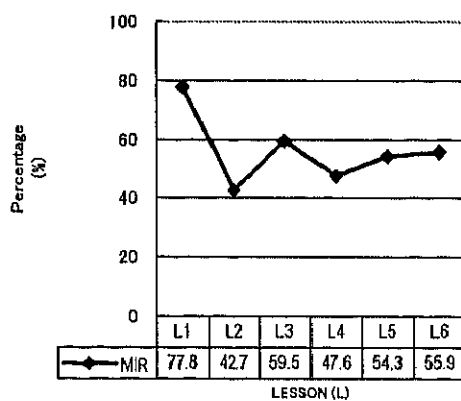
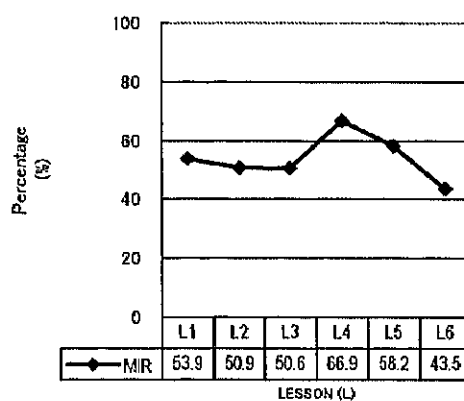


Fig. 5-8: Proportion of maximum involvement rate (MIR) during A2 episode in gymnastics unit for grade 3-1



5.3.3. Students' PAL

5.3.3.1. Number of students' steps

In general, as shown in table 5-1 part C on page 59, students in the 22 lessons has averagely 2146 ± 552 number of steps. Compared to the other

classes, the gymnastics unit for grade 3-1 has highest number of steps (2241±478 steps) and in contrast, the gymnastics unit for grade 2-3 has the lowest average number of steps (2087±496 steps). Average number of students' step inside of each unit could be seen in figure 5-9, 5-10, 5-11, and 5-12.

Fig. 5-9: Average number of student's step in gymnastics unit for grade 2-1

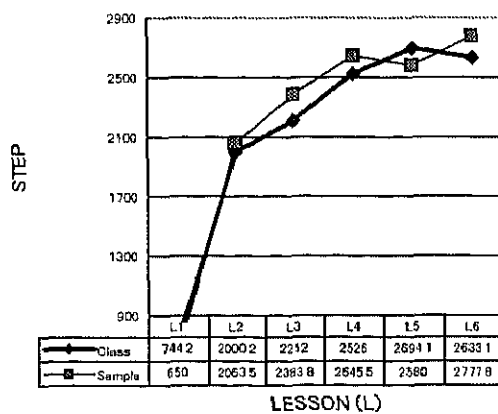


Fig. 5-10: Average number of student's step in gymnastics unit for grade 2-2

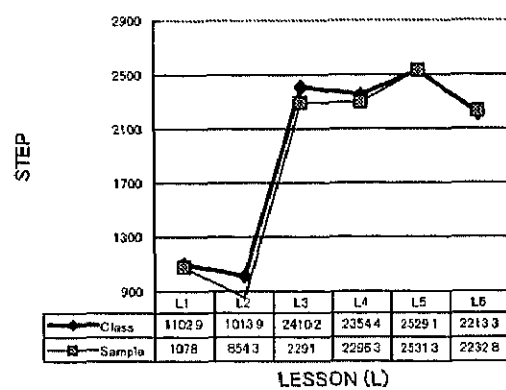


Fig. 5-11: Average number of student's step in gymnastics unit for grade 2-3

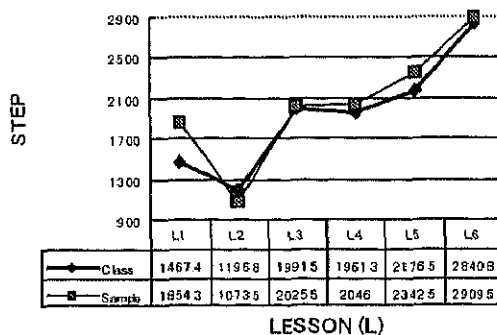
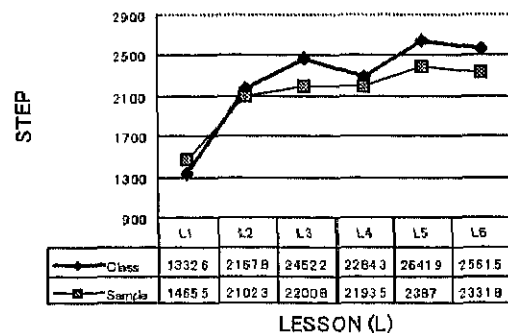


Fig. 5-12: Average number of student's step in gymnastics unit for grade 3-1



5.3.3.2. Intensity of students' PA

In general, as shown in table 5-1 part D on page 59, students in the 22 lessons have averagely 1.89 ± 0.41 intensity of PA. Compared to the

other classes, the gymnastics unit for grade 3-1 has highest intensity of students' PA (2.12 ± 0.35) and in contrast, the gymnastics unit for grade 2-2 has the lowest intensity of students' PA (1.75 ± 0.41). Average intensity of students' PA inside of each unit could be seen in figure 5-13, 5-14, 5-15, and 5-16.

Fig. 5-13: Average intensity of student's PA in gymnastics unit for grade 2-1

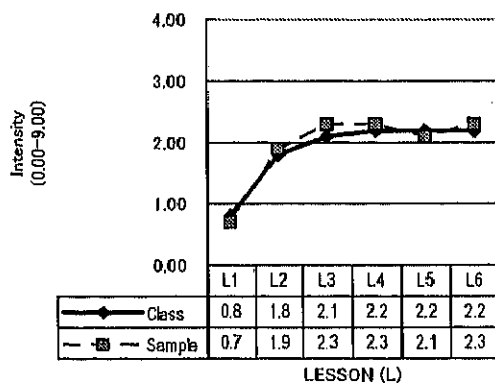


Fig. 5-14: Average intensity of student's PA in gymnastics unit for grade 2-2

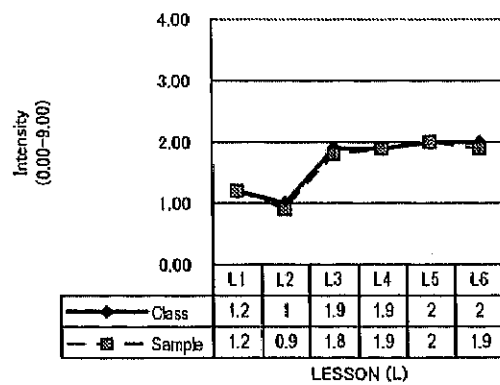


Fig. 5-15: Average intensity of student's PA in gymnastics unit for grade 2-3

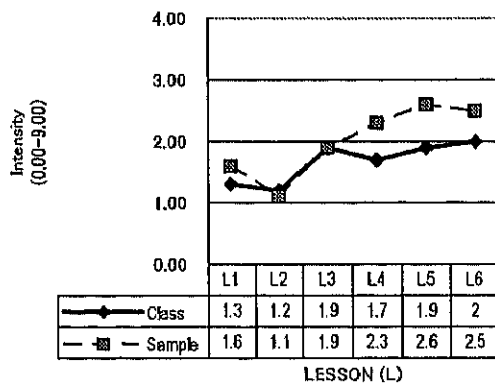
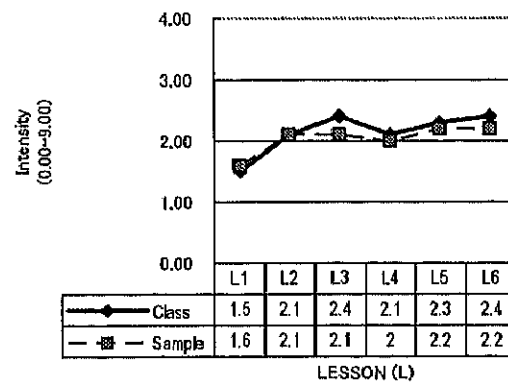


Fig. 5-16: Average intensity of student's PA in gymnastics unit for grade 3-1



5.3.4. Proportion of A2 episodes used by students to engage in MV-PAL

In general, as shown in table 5-1 part G on page 59, during the 22 lessons, averagely 72.2 ± 10.7 % of A2 episodes was used by sample students for engaging in MV-PAL. Inside the MV-PAL engagement,

averagely 55.2 ± 11.3 % of A2 episodes was used for engaging in MV-PAL for learning activities. The rest of their MV-PAL engagement during A2 episodes (16.9 ± 9.3 %) was for engagement in non-learning activities. The detail proportion of students' MV-PAL engagement in each unit is shown in figure 5-17, 5-18, 5-19, and 5-20.

Fig. 5-17: Proportion of students' MV-PAL engagement during A2 episode in gymnastics unit for grade 2-1

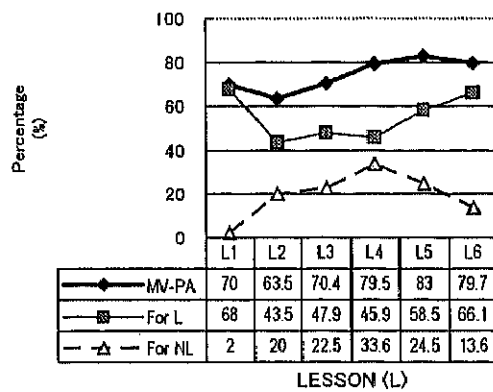


Fig. 5-18: Proportion of students' MV-PAL engagement during A2 episode in gymnastics unit for grade 2-2

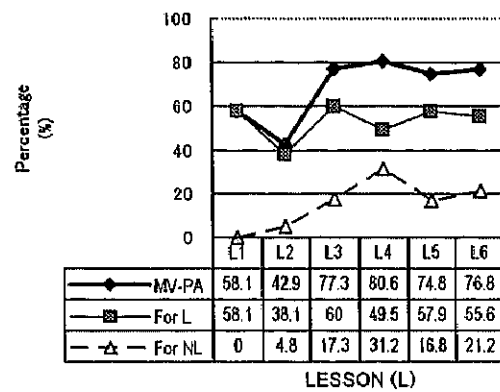


Fig. 5-19: Proportion of students' MV-PAL engagement during A2 episode in gymnastics unit for grade 2-3

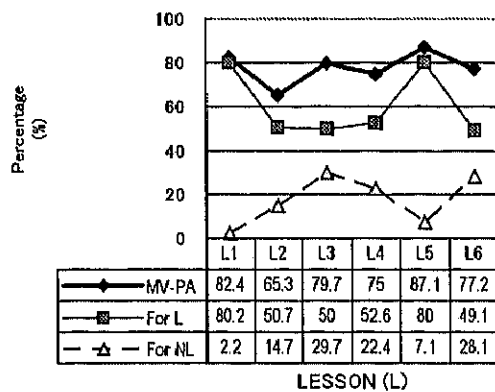
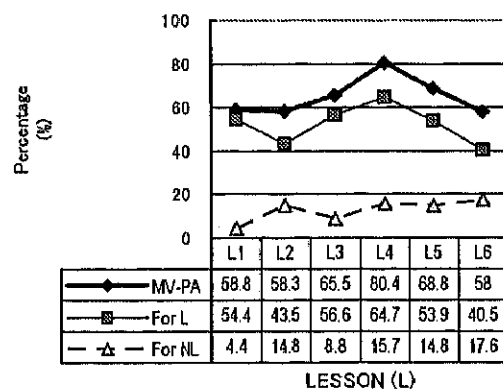


Fig. 5-20: Proportion of students' MV-PAL engagement during A2 episode in gymnastics unit for grade 3-1



5.3.5. Students' formative class evaluation (FCE) scores

5.3.5.1. Class average of students' FCE scores

In general, as shown in table 5-1 part A on page 59, average total score of students' FCE during the 22 lessons was 2.74 ± 0.08 . The highest

average total score was found in grade 2-2 (2.78 ± 0.13), and the lowest average total score was found in grade 3-1 (2.68 ± 0.06). The detail average of students' FCE scores from each unit is shown in figure 5-21, 5-22, 5-23, and 5-24.

Fig. 5-21: Average students' FCE scores in gymnastics unit for grade 2-1

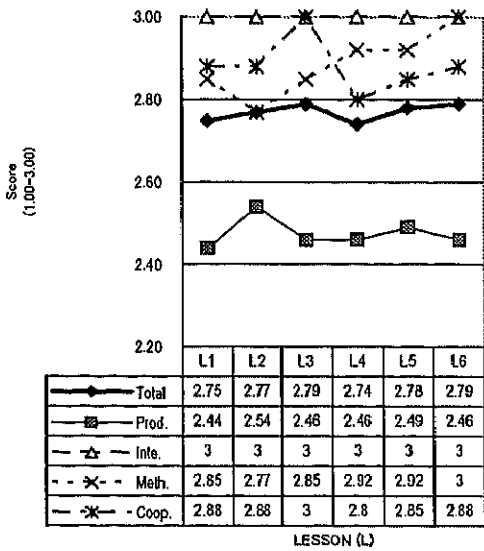


Fig. 5-22: Average students' FCE scores in gymnastics unit for grade 2-2

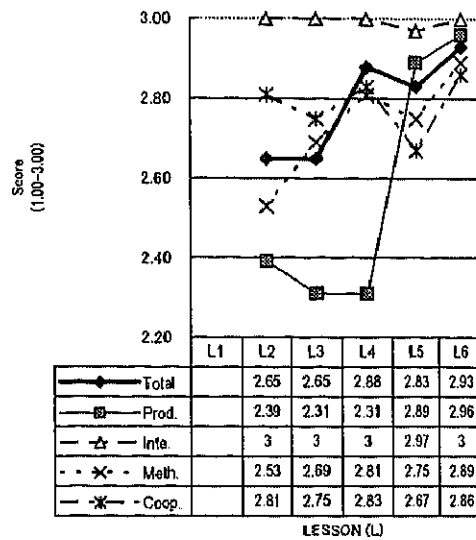


Fig. 5-23: Average students' FCE scores in gymnastics unit for grade 2-3

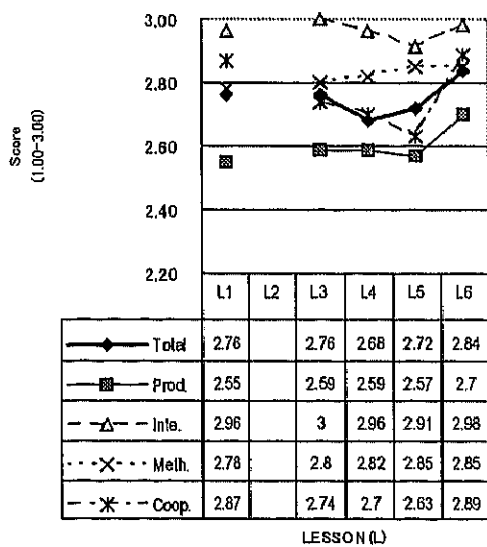
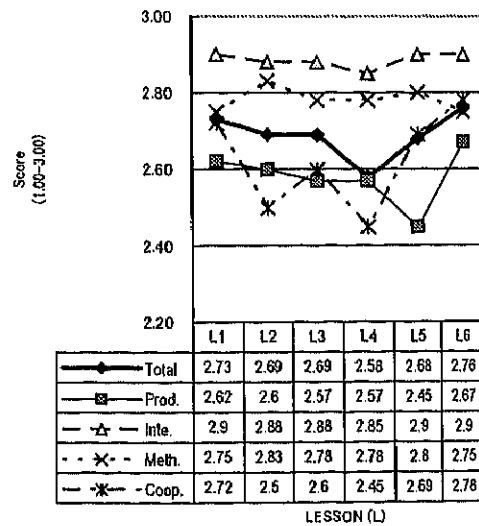


Fig. 5-24: Average students' FCE scores in gymnastics unit for grade 3-1



5.3.5.2. Sample average of students' FCE scores

In general, as shown in table 5-1 part B on page 59, during the 22 lesson, average total FCE score of sample students was 2.75 ± 0.10 .

Fig. 5-25: Average 4 students' FCE scores in gymnastics unit for grade 2-1

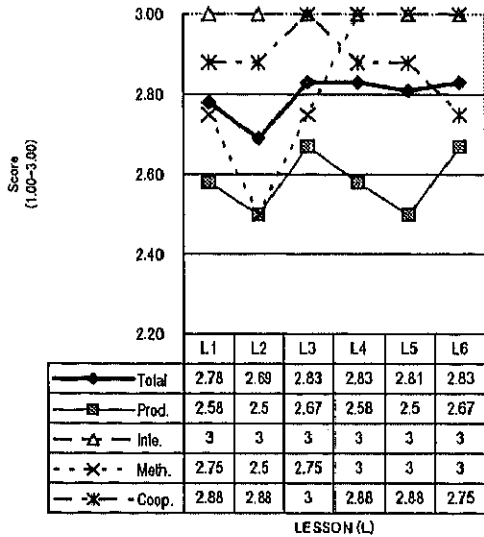


Fig. 5-26: Average 4 students' FCE scores in gymnastics unit for grade 2-2

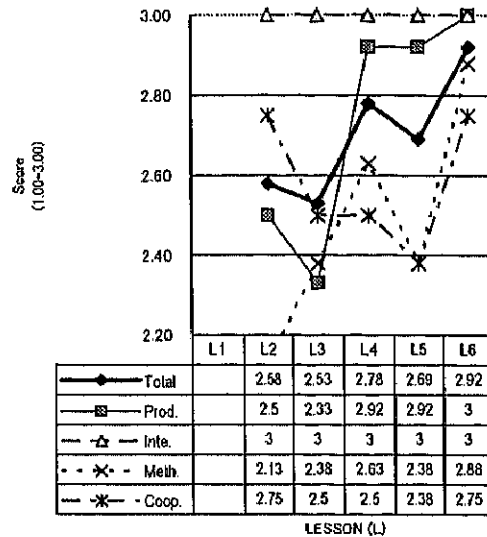


Fig. 5-27: Average 4 students' FCE scores in gymnastics unit for grade 2-3

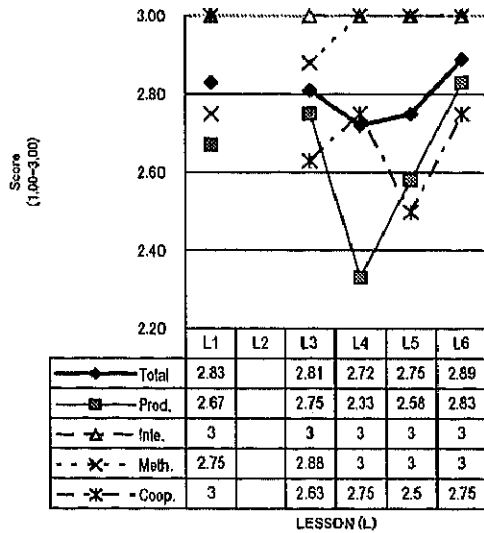
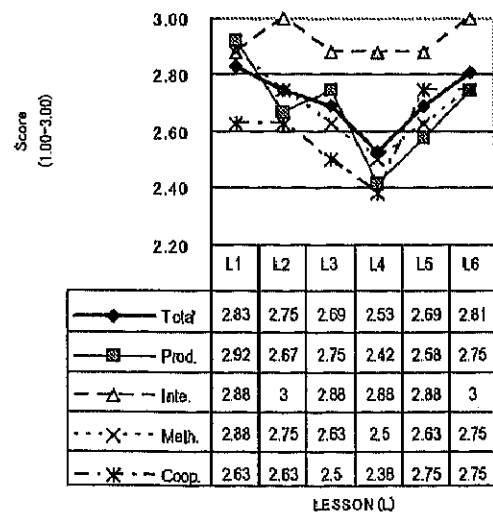


Fig. 5-28: Average 4 students' FCE scores in gymnastics unit for grade 3-1



The highest average total score was found in grade 2-3 (2.80 ± 0.06), and the lowest average total score was found in grade 2-2 (2.70 ± 0.15). The detail

average FCE score of sample students in each unit is shown in figure 5-25, 5-26, 5-27, and 5-28.

5.3.6. Students' learning behavior (LB) during A2 episodes

As shown in table 5-1 part H on page 59, in general, average proportion of sample students' engagement in learning during A2 episodes was 62.6 ± 11.6 %.

Fig.5-29: Proportion of learning and non-learning behavior during A2 episode in gymnastic unit for grade 2-1

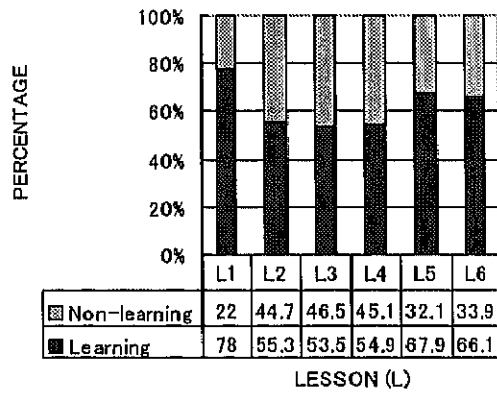


Fig. 5-30: Proportion of learning and non-learning behavior during A2 episode in gymnastic unit for grade 2-2

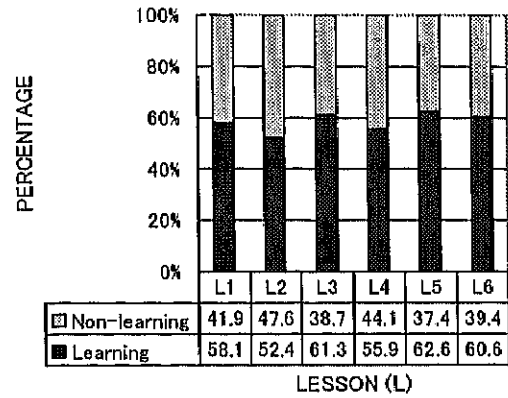


Fig. 5-31: Proportion of learning and non-learning behavior during A2 episode in gymnastic unit for grade 2-3

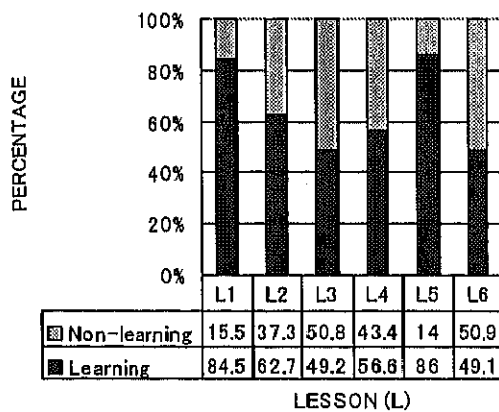
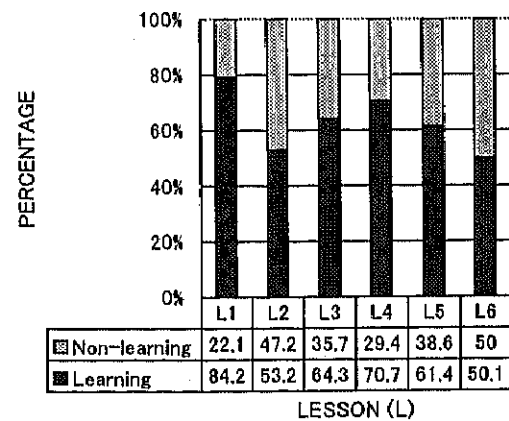


Fig. 5-32: Proportion of learning and non-learning behavior during A2 episode in gymnastic unit for grade 3-1



The highest proportion of sample students' engagement in learning during

A2 episodes was found in grade 2-3 (65.1 ± 18.6 %), and the lowest proportion of sample students' engagement in learning during A2 episodes was found in grade 2-2 (58.8 ± 4.2 %). In other side, in general, average proportion of sample students' engagement in non-learning during A2 episodes was 37.6 ± 11.1 %. The lowest proportion of sample students' engagement in non-learning during A2 episodes was found in grade 2-3 (34.8 ± 18.6 %), and the highest proportion of sample students' engagement in non-learning during A2 episodes was found in grade 2-2 (41.4 ± 4.2 %). The detail average proportions of sample students' engagement in learning behavior in each unit is shown in figure 5-29, 5-30, 5-31, and 5-32.

5.3.7. Relationships among variables (PAL, LB, and FCE)

5.3.7.1. Relationships between students' formative class evaluation (FCE) and students' physical activity level (PAL)

As shown in table 5-2 left side on page 69, total score of FCE and students' PAL (number of student's steps and intensity of student's PA) has positive non-significant relationship ($r = .203$ and $r = .089$). The significant positive relationship was only found between PAL and item score of "spontaneous learning" ($r = .442^*$ and $r = .477^*$). In table 5-2 right side on page 69, total score of PAL has also non-significant relationships with proportion of students' MV-PAL engagement during A2 episodes ($r = .283$), with proportion of MVPA-Learning ($r = -.046$), and with proportion of MVPA-Non-learning ($r = .379$). The coefficient correlation among individual scores of FCE and student's PAL could be seen in table 5-3 and table 5-4.

Table 5-2: Correlations among students' formative class evaluation (FCE) scores, number of students' steps during PE class (steps), intensity of students' PA (IPA), maximum involvement rate (MIR), and proportion of episodes student engaging in MV-PAL

| FCE | PAL | | | | | | | |
|-----------------------------|-----------|-------|---------------|---------|-------|------------------------|--------|---------|
| | Pedometer | | Class Context | | MIR | MV-PAL Engagement Rate | | |
| | Steps | IPA | A2 | M | | MVPA-A2 | MVPA-L | MVPA-NL |
| FCE (Class average) | | | | | | | | |
| Total Score | .203 | .089 | .011 | -.186 | -.101 | .283 | -.046 | .379 |
| Products | .175 | .206 | .294 | -.192 | .004 | .042 | .007 | .040 |
| 1. Impressive experience | .135 | .165 | .279 | -.277 | .164 | .020 | -.046 | .079 |
| 2. Skill | -.138 | .070 | -.082 | -.198 | -.220 | .266 | .038 | .212 |
| 3. Knowledge | .227 | .123 | -.022 | .327 | -.347 | .012 | -.233 | .295 |
| Volition and interest | -.104 | -.309 | -.524* | .331 | -.311 | .209 | -.116 | .379 |
| 4. Doing one's best | -.093 | -.297 | -.463* | .314 | -.307 | .279 | -.019 | .341 |
| 5. Fun | -.060 | -.109 | -.251 | .130 | -.087 | -.168 | -.330 | .206 |
| Way of learning | .440* | .420 | .430* | -.463* | .239 | .639** | .296 | .373 |
| 6. Spontaneous learning | .442* | .477* | .231 | -.117 | .173 | .503* | .074 | .466* |
| 7. Learning for own goal | .289 | .232 | .371 | -.583** | .211 | .530* | .373 | .156 |
| Cooperation | -.121 | -.265 | -.357 | -.043 | -.167 | .066 | -.095 | .191 |
| 8. Friendly manner | -.211 | -.231 | -.266 | -.256 | -.069 | -.192 | -.076 | -.127 |
| 9. Cooperative learning | -.041 | -.234 | -.343 | .099 | -.195 | .215 | -.088 | .352 |
| FCE (Sample average) | | | | | | | | |
| Total Score | .098 | .097 | .180 | -.460* | .191 | .230 | .010 | .250 |
| Products | .107 | .132 | .099 | -.249 | .045 | -.012 | -.100 | .098 |
| Volition and interest | -.030 | -.193 | -.253 | .162 | -.293 | .176 | -.090 | .309 |
| Way of learning | .252 | .256 | .354 | -.391 | .325 | .503* | .236 | .291 |
| Cooperation | -.240 | -.242 | -.092 | -.324 | .067 | -.095 | -.110 | .250 |

Table 5-3: Correlations among FCE, number of students' steps, and intensity of students' PA

| Variable | | Grade 2-1 (N=13) | | Grade 2-2 (N=18) | | Grade 2-3 (N=20) | | Grade 3-1 (N=20) | | Total (N=71) | |
|--------------------|----------|---------------------|--------|---------------------|--------|---------------------|--------|---------------------|--------|-----------------|--------|
| | | Steps | Intent | Steps | Intent | Steps | Intent | Steps | Intent | Steps | Intent |
| FCE (Class) | | | | | | | | | | | |
| Total score of FCE | Lesson 1 | -.155 | -.315 | .406 | | .281 | .233 | .029 | .028 | | |
| | Lesson 2 | -.077 | -.166 | .033 | -.309 | | | .021 | .108 | | |
| | Lesson 3 | .457 | .387 | .407 | .106 | .355 | .294 | .040 | .011 | .117 | .104 |
| | Lesson 4 | .014 | -.011 | .093 | -.020 | .550* | .049 | -.067 | -.019 | .204 | -.042 |
| | Lesson 5 | .087 | .054 | -.011 | .198 | .390 | .005 | -.358 | -.367 | .017 | -.092 |
| | Lesson 6 | -.219 | -.371 | -.269 | -.156 | .028 | -.152 | -.115 | -.128 | -.173 | -.217 |

Table 5-4: Correlations between students' FCE and intensity of PA inside motor learning (A2) episode

| Variable | | Grade 2-1 (N=13) | Grade 2-2 (N=18) | Grade 2-3 (N=20) | Grade 3-1 (N=20) | Total (N=71) |
|--------------------|----------|---------------------|---------------------|---------------------|---------------------|-----------------|
| | | IPA-A2 | IPA-A2 | IPA-A2 | IPA-A2 | IPA-A2 |
| FCE (Class) | | | | | | |
| Total score of FCE | Lesson 1 | -.302 | | .292 | -.134 | |
| | Lesson 2 | -.127 | .148 | | .027 | |
| | Lesson 3 | .216 | .536* | .184 | -.111 | .171 |
| | Lesson 4 | .012 | .397 | .341 | .054 | -.036 |
| | Lesson 5 | -.103 | .169 | .199 | -.312 | -.082 |
| | Lesson 6 | -.411 | -.061 | -.234 | -.185 | -.189 |

5.3.7.2. Relationships between students' formative class evaluation (FCE) and students' learning behavior (LB)

As shown in table 5-5, no significant relationship was found between student's FCE scores and total proportions of both learning engagement and non-learning engagement.

Table 5-5: Correlations between students' formative class evaluation (FCE) scores and proportion of A2 episodes used by students for engaging in learning behavior (LB) categories

| Variable | Learning Engagement | | | | | Non-Learning Engagement | | |
|--------------------------|---------------------|--------|----------|-----------|------------|-------------------------|----------------|----------|
| | Total | Direct | Indirect | Cognitive | Supportive | Total | With/transport | Off-task |
| A. FCE (Class) | | | | | | | | |
| Total Score | -.142 | -.092 | . | -.123 | .036 | .141 | .169 | -.090 |
| Products | -.020 | -.041 | . | .114 | -.079 | .032 | -.024 | .234 |
| 1. Impressive experience | .020 | -.062 | . | .243 | -.094 | .006 | -.070 | .312 |
| 2. Skill | -.106 | -.080 | . | -.318 | .300 | .078 | .138 | -.229 |
| 3. Knowledge | -.263 | -.200 | . | .017 | -.140 | .279 | .276 | .059 |
| Volition and interest | -.269 | -.167 | . | -.393 | .228 | .247 | .370 | -.458* |
| 4. Doing one's best | -.194 | -.060 | . | -.439* | .204 | .164 | .299 | -.522* |
| 5. Fun | -.296 | -.372 | . | .046 | .129 | .317 | .310 | .087 |
| Way of learning | .111 | .330 | . | -.137 | -.328 | -.131 | -.072 | -.263 |
| 6. Spontaneous learning | -.079 | .235 | . | .002 | -.673** | .082 | .138 | -.213 |
| 7. Learning for own goal | .225 | .294 | . | -.202 | .061 | -.258 | -.216 | -.214 |
| Cooperation | -.143 | -.152 | . | -.211 | .260 | .136 | .187 | -.181 |
| 8. Friendly manner | .003 | -.109 | . | -.042 | .288 | .091 | .028 | -.100 |
| 9. Cooperative learning | -.205 | -.149 | . | -.275 | .192 | .194 | .250 | -.198 |
| B. FCE (Sample) | | | | | | | | |
| Total Score | .006 | .044 | . | .134 | -.230 | .013 | -.007 | .087 |
| Products | -.027 | -.107 | . | .284 | -.139 | .065 | .010 | .236 |
| Volition and interest | -.312 | -.148 | . | -.465* | .178 | .270 | .313 | -.128 |
| Way of learning | .159 | .315 | . | .119 | -.475* | -.150 | -.153 | -.018 |
| Cooperation | -.072 | -.103 | . | -.125 | .208 | .063 | .085 | -.080 |

5.3.7.3. Relationships between students' learning behavior (LB) and students' physical activity level (PAL)

As shown in table 5-6 bottom part (visual) on page 71, significant relationships were found between student's PAL and student's LB. The table showed that the proportion of student's engagement in MV-PAL for learning (MVPA-L): correlated positively with proportion of student's engagement in learning activities ($r = .847^{**}$), correlated positively with proportion of engagement directly in motor learning ($r = .956^{**}$), but

correlated negatively with non-learning engagement activities ($r = -.887^{**}$) especially for waiting or transporting activities ($r = -.822^{**}$). In contrast, proportion of student's engagement in MV-PAL for non-learning (MVPA-NL): correlated negatively with proportion of student's engagement in learning activities ($r = -.687^{**}$) especially engagement directly in motor learning ($r = -.444^{**}$), and correlated positively with non-learning engagement activities ($r = .679^{**}$) especially for waiting or transporting activities ($r = .729^{**}$).

Table 5-6: Correlations between students' physical activity level (PAL) and proportion of episodes used by students for engaging in learning behavior categories (LB)

| Variable | | Learning Engagement | | | | Non-Learning Engagement | | | |
|-------------------------------|-----------------|---------------------|--------|----------|-----------|-------------------------|---------|----------------|----------|
| | | Total | Direct | Indirect | Cognitive | Supportive | Total | Wait/transport | Off-task |
| Students' PAL (Sample) | | | | | | | | | |
| LifeCorder | Number of steps | -.287 | .016 | . | -.268 | -.339 | .266 | .278 | -.004 |
| | Intensity of PA | -.233 | .051 | . | -.168 | -.413 | .221 | .217 | .053 |
| Visual | MVPA-A2 | .294 | .621** | . | -.338 | -.349 | -.342 | -.231 | -.514* |
| | MVPA-L | .847** | .956** | . | -.055 | -.220 | -.887** | -.822** | -.417 |
| | MVPA-NL | -.687** | -.444* | . | -.319 | -.134 | .679** | .729** | -.083 |

5.4. Discussion

In this study, average students' PAL during 22 lesson of gymnastic unit for 2nd and 3rd grade elementary school was 2146 steps, 1.89 levels of intensity, and 72.2 % of A2 episodes MV-PAL engagement. Those PAL values (steps, intensity of PA, and MV-PAL engagement rate) were located in between the PAL values for aerobic unit and the PAL values for non-aerobic unit for 6th grade elementary school students in our previous study. The students' PAL during the aerobic unit for 6 graders was averagely 2498 steps, 2.47 levels of intensity, and 76.26 % of A2 episodes MV-PAL

engagement. The students' PAL during the non-aerobic unit for 6 graders was averagely 1243 steps, 1.17 levels of intensity, and 48.49 % of A2 episodes for MV-PAL engagement. The average number of students' step in this study was 2146 steps. This number was 21.46% from 10,000 steps (minimum steps suggested in a day) and equal to the large part of daily PA for sedentary students as reported in Kaga et al. (1997).

Average total score of students' FCE in this study was 2.74. It was also in between the average FCE score for aerobic unit and non-aerobic unit for 6th grade elementary school students in previous study. In previous study the average was 2.72 for aerobic unit vs. 2.88 for non-aerobic unit. Although, score of 2.74 was inside level 4 category of FCE in Hasegawa et al. (1995), the value was higher than the average FCE total score of the aerobic unit. It means that the gymnastics units were evaluated higher by students than the aerobic unit in our previous study.

Proportion of students' learning behavior (LB) in this study was divided to be learning engagement and non-learning engagement categories. The average proportion of learning engagement in this study was 62.2 % and non-learning engagement was 37.6 %. It was located below the aerobic unit but above the non-aerobic unit for 6th grade elementary school students in our previous study (86.4% for aerobic unit and 50.3% for non-aerobic unit).

The relationship between total score of students' FCE and students' PAL in this study was non-significant ($r < .379$). The relationship between total score students' FCE and students' LB was also non-significant ($r < .169$). But, the proportion student engage in MV-PAL during A2 episode

correlated positively with the proportion of learning engagement that directly for motor learning ($r = .621^{**}$), and correlated negatively with proportion of engagement in non-learning especially off-task ($r = -.514^*$). The proportion of student's engagement in MV-PAL for learning (MVPA-L) correlated positively with proportion of student's engagement in learning activities ($r = .847^{**}$), especially engagement directly in motor learning ($r = .956^{**}$), and correlated negatively with non-learning engagement activities ($r = -.887^{**}$) especially for waiting or transporting activities ($r = -.822^{**}$). In contrast, proportion of student's engagement in MV-PAL for non-learning (MVPA-NL) correlated negatively with proportion of student's engagement in learning activities ($r = -.687^{**}$), especially engagement directly in motor learning ($r = -.444^{**}$), and correlated positively with non-learning engagement activities ($r = .679^{**}$) especially for waiting or transporting activities ($r = .729^{**}$). It means that although the general relationship among students' PAL, students' LB, and students' FCE was not significant, the relationship between students' PAL and students' LB in A2 episodes level was significant.

5.5. Conclusion

The students' PAL during gymnastic unit of PE classes for 2nd and 3rd grade elementary school was averagely 2146 steps, 1.89 levels of intensity, and 72.2 % of A2 episodes MV-PAL engagement. The students' FCE during gymnastic unit of PE classes for 2nd and 3rd grade elementary school in this study was averagely 2.74. The average proportion of A2 episodes used by student to engagement in learning activities during of

gymnastic unit of PE classes for 2nd and 3rd grade elementary school was averagely only 62.2 %. It means that in the rest proportion of A2 episodes, student engaged in other than learning activities.

During gymnastic unit of PE classes for 2nd and 3rd grade elementary school, the general relationship among students' PAL, students' LB, and students' FCE was not clear, but inside the A2 episodes, the relationship between students' PAL and students' LB was significant. Thus, in relation with the results from previous studies, it was reconfirmed the close relationship between students' PAL and students' LB.