

## **Chapter 3**

### **RELATIONSHIPS AMONG STUDENTS' FORMATIVE CLASS EVALUATION (FCE) SCORE, STUDENTS' LEARNING BEHAVIOR (LB), AND STUDENTS' ENGAGEMENT IN MODERATE TO VIGOROUS PHYSICAL ACTIVITY LEVEL (MV-PAL)**

#### **3.1. Purpose**

The purposes of the first phase studies were:

- (1) To describe variable student's learning behavior (LB) during motor learning (A2) episodes, student's formative class evaluation (FCE) score, and student's physical activity level (PAL);
- (2) To clarify the relationship between students' learning behavior (LB) during motor learning (A2) episodes and their formative class evaluation (FCE) score;
- (3) To clarify the relationship between students' learning behavior (LB) during motor learning (A2) episodes and their physical activity level (PAL);
- (4) To clarify the relationship between students' physical activity level (PAL) during motor learning (A2) episodes and their formative class evaluation (FCE) score;
- (5) To clarify the interrelationship among variable LB, FCE, and PAL during elementary school PE classes.

#### **3.2. Methods**

##### **3.2.1. Subjects**

Sixty physical education classes at 16 elementary schools in Kanto area of Japan were investigated in between 1994 to 2001. The sixty classes consisted of 30 gymnastics classes and ball games classes. There were 42 teachers involved, and each teacher was in charge of 1-2 classes that selected from the middle of their unit. The student-subjects were the fifth and sixth grades. The purpose of investigation was explained to each of school principal and the teachers in charge, and agreements were obtained.

### 3.2.2. Observation of learning behavior (LB) in PE classes

The observation categories of students' learning behaviors (LB) are could be seen in table 3-1.

**Table 3-1: Observation categories of students' learning behavior (LB) in ball games and gymnastics classes**

Observation categories		Examples	
Learning engagement	Directly motor learning	Gymnastics	to practice skill. to perform in the exhibition.
		Ball games	to practice pass and catch with partners. to dribble in a game. to move to open space to receive a pass.
	Indirectly motor learning	Ball games	to stand by and just wait for turn in a pass-game. to look at the ball in the game. to stay back and keep the goal while teammates are attacking.
	Assistance to others	Ball games	to assist friends who practicing a skill. to play a role as chairman of exhibition.
		Gymnastics	to feed a ball to friends in the shoot practice. to observe a game and to cheer up the team. to play a role as a referee or as a scorekeeper.
	Cognitive learning	Ball games	to receive instruction from teacher about a skill to fill in a learning sheet. to evaluate the performance of others.
Gymnastics		to plan strategy with teammates. to reflect about the game and fill in the score sheet. to observe and record a game.	
Non-engagement	Non-learning activity	Ball games	to wait for turn. to move to the next activity. to prepare a vaulting box.
		Gymnastics	to wait for the turn to play a game without doing anything. to stand on the waiting line for the next turn of practice. to move to the game court. to wait for the restart when the ball out of court.
	Off-task activity	Ball games	to chat and joke with friend. to play with sand. to go to drink water without permission.

The 6 categories were developed by Fukugasako et al. (2003). In the first phase studies, student's learning behavior in motor learning episodes were classified into two categories: (1) learning engagement, and (2) non-learning engagement. The learning engagement was divided into four: engage directly in motor learning, engage indirectly in motor learning, engage in assisting others' learning, and engage in cognitive learning. The non-learning engagement was separated into non-learning activity and off-task behavior.

### 3.2.3. Measurement of students' formative class evaluation (FCE)

The students' formative class evaluation method standardized by Takahashi et al. (1994) and Hasegawa et al., (1995) was employed as a means for understanding the effectiveness of the physical education classes from student viewpoint.

**Table 3-2: Formative class evaluation questionnaire**  
**Formative Evaluation of Physical Education Class**

Date	:	Day: .....	Month: .....	Year: .....	
Name	:	.....			Male Female
Grade and class	:	Grade: .....	Class: .....		
Roll number in class	:	.....			
Name of school	:	.....			E.S. J.H.S.

This questionnaire is for the physical education class you attended today. Please answer question 1 to 9 by circling one appropriate answer.

Question		Answer		
1	Did anything deeply impress you or move you?	Yes	No	Neutral
2	Did you acquire new skill(s), which you could not do before (physical exercise or tactics)?	Yes	No	Neutral
3	Was there anything, which made you think: "Oh, I understand it" or "Oh, I got it?"	Yes	No	Neutral
4	Were you able to do physical activity to the best of your ability and as hard as you could?	Yes	No	Neutral
5	Was the class fun?	Yes	No	Neutral
6	Did you learn spontaneously?	Yes	No	Neutral
7	Did you practice many times to achieve your own goal?	Yes	No	Neutral
8	Were you able to learn in friendly manner with your classmates?	Yes	No	Neutral
9	Did you and your classmates teach and help each other?	Yes	No	Neutral

This method consists of 9 items 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 end. 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 from individual participants' points. The questionnaire can be seen in table 3-2 on page 23 and the diagnostic standard for the class points could be seen in table 3-3.

**Table 3-3: Diagnostic Standard of Physical Education Class  
(For All Subject Matters)**

Dimension	Items	Rating				
		5	4	3	2	1
Product/ Outcome	1. Impressive Experience	3.00-2.62	2.61-2.29	2.28-1.90	1.89-1.57	1.56-1.00
	2. Skill	3.00-2.82	2.81-2.54	2.53-2.21	2.20-1.93	1.92-1.00
	3. Knowledge	3.00-2.85	2.84-2.59	2.58-2.28	2.27-2.02	2.01-1.00
	Score of Dimension	3.00-2.70	2.69-2.45	2.44-2.15	2.14-1.91	1.90-1.00
Volition and Interest/ Motivation	4. Doing One's Best	3.00	2.99-2.80	2.79-2.56	2.55-2.37	2.36-1.00
	5. Fun	3.00	2.99-2.85	2.84-2.60	2.59-2.39	2.38-1.00
	Score of Dimension	3.00	2.99-2.81	2.80-2.59	2.58-2.41	2.40-1.00
Way of Learning	6. Spontaneous Learning	3.00-2.77	2.76-2.52	2.51-2.23	2.22-1.99	1.98-1.00
	7. Learning for Your Own Goal	3.00-2.94	2.93-2.65	2.64-2.31	2.30-2.03	2.02-1.00
	Score of Dimension	3.00-2.81	2.80-2.57	2.56-2.29	2.28-2.06	2.04-1.00
Cooperation	8. Friendly Manner	3.00-2.92	2.91-2.71	2.70-2.46	2.45-2.25	2.24-1.00
	9. Cooperative Learning	3.00-2.83	2.82-2.55	2.54-2.24	2.23-1.97	1.96-1.00
	Score of Dimension	3.00-2.85	2.84-2.62	2.61-2.36	2.35-2.13	2.12-1.00
	Total Score	3.00-2.77	2.76-2.58	2.57-2.34	2.33-2.15	2.14-1.00

#### 3.2.4. Observation of physical activity level (PAL) in PE class

In this study, McKenzie's five PAL categories (lying down, sitting, standing, walking/active, and very active) that originally uses for coding only a student every interval, for getting more representative data, was used for categorizing all students' PA behavior by using GTS format. For

counting number of students who engaged in each PAL categories, we decided each student's PAL based on the observed activity of each student at a moment of observation. In the first phase-studies, the walking/ active, and very active categories were combined to be one as a new category called moderate to vigorous physical activity level (MV-PAL). The categories could be seen in table 3-4.

**Table 3-4: Student's PAL categories and Estimated Energy Cost Values**

(Source: McKenzie et al. 1991a)

Activity category	Code	Activity examples	Mean (SD) Heart rate	Mean (SD) energy cost kcal/kg/min
Lying	PAL1	Lying watching TV	99 (9.9)	0.029 (0.013)
Sitting	PAL2	Sitting watching TV, kneeling, easy swinging	107 (9.8)	0.047 (0.018)
Standing	PAL3	Standing and talking	110 (8.8)	0.051 (0.021)
Walking	PAL4	Slow and easy walking, vigorous walking	130 (6.5)	0.096 (0.015)
Very active	PAL5	Cycling, running, hand swinging, sliding (includes climbing and running)	153 (12.6)	0.144 (0.026)

### 3.2.5. 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.

## 3.3. Results

### 3.3.1. Students' formative class evaluation (FCE) scores

Table 3-5 on page 26 shows average of students' FCE scores during 60 PE classes, 30 Gymnastics classes, and 30 Ball Games classes. As clearly shown in the table, average of total scores of students' FCE was

similar between Ball Games classes and Gymnastics classes (2.65 vs. 2.71). However, in level of item score, there were 3 items' scores that Gymnastics classes had significantly higher scores than Ball Games classes. The three items were knowledge (2.73 vs. 2.55), learning for own goal (2.78 vs. 2.49), and friendly manner (2.84 vs. 2.72).

**Table 3-5: Students' formative class evaluation (FCE) score**

Students' FCE	60 Classes			Gymnastics			Ball Games			t-test	
	FCE Score			FCE Score			FCE Score				
	Ava	Max	Min	Ava	Max	Min	Ava	Max	Min		
Total Score	2.68	2.97	2.18	2.71	2.97	2.25	2.65	2.96	2.18	1.29	
Products	2.53	2.95	1.93	2.52	2.95	1.93	2.53	2.90	2.12	-0.03	
1. Impressive experience	2.35	2.97	1.62	2.29	2.97	1.62	2.41	2.93	1.90	-1.35	
2. Skill	2.60	2.95	1.95	2.57	2.92	1.95	2.63	2.95	2.19	-0.28	
3. Knowledge	2.64	3.00	2.07	2.73	3.00	2.20	2.55	2.89	2.07	3.02	**
Volition and Interest	2.86	3.00	2.39	2.85	3.00	2.42	2.86	3.00	2.39	-0.06	
4. Doing one's best	2.83	3.00	2.22	2.83	3.00	2.30	2.83	3.00	2.22	-0.05	
5. Fun	2.88	3.00	2.50	2.88	3.00	2.53	2.88	3.00	2.50	-0.05	
Way of learning	2.65	2.99	1.98	2.75	3.08	2.30	2.55	2.99	1.98	3.31	**
6. Spontaneous learning	2.66	3.00	1.96	2.71	3.00	2.10	2.61	2.99	1.96	1.63	
7. Learning for your own goal	2.64	3.00	2.00	2.78	3.00	2.16	2.49	2.97	2.00	4.56	**
Cooperation	2.76	3.00	2.17	2.81	3.00	2.38	2.71	2.97	2.17	2.05	*
8. Friendly manner	2.78	3.00	2.31	2.84	3.00	2.50	2.72	3.00	2.31	2.64	*
9. Cooperative learning	2.74	3.00	2.04	2.77	3.00	2.27	2.71	3.00	2.04	1.20	

Note: \*Sig.  $\leq .05$ ; \*\*Sig.  $\leq .01$

### 3.3.2. Students' physical activity level (PAL)

Table 3-6 on page 27 shows the proportion of students' MV-PAL engagement in each of categories during each learning context of 60 PE classes, 30 Gymnastics classes, and 30 Ball Games classes. As clearly seen in the table, in general, MV-PAL engagement during PE classes was averagely 40.48% (Min 27.00% and Max 64.03%), and has no significant different of average between Gymnastics and Ball Games classes (40.15% vs. 40.80%). But, in context categories level, both groups have significant difference of MV-PAL engagements during A2 and M episodes. In general, MV-PAL engagement during A2 episode was averagely 50.47% (Min 29.34% and Max 77.12%). In Gymnastics classes, MV-PAL engagement

during A2 episode was significantly lower than in Ball Games classes (45.72% vs. 55.23%;  $t = -3.68^{**}$ ,  $Sig. \leq .01$ ), and in reverse, MV-PAL engagement during M episode in Gymnastics classes was significantly higher than in Ball Games classes (55.51% vs. 37.91%;  $t = 5.30^{**}$ ,  $Sig. \leq .01$ ). Thus, during M episodes, many of students in Ball Games classes were moving fast.

**Table 3-6: Students' PAL and MVPA level**

PAL Categories and Context	60 Classes			Gymnastics			Ball Games			t-test
	Proportion (%)			Proportion (%)			Proportion (%)			
	Ave.	Max	Min.	Ave.	Max.	Min.	Ave.	Max.	Min.	
<i>Total PE Class (T) Episodes (47.52 min)</i>										
MVPA (PAL5 + PAL 4)	40.48	64.03	27.00	40.15	63.63	27.00	40.80	64.03	27.66	-28
Very Active Level (PAL5)	14.24	33.85	5.91	12.76	24.11	5.91	15.72	33.85	9.27	-2.10*
Active Level (PAL4)	26.24	47.19	17.69	27.39	47.19	18.86	25.08	32.39	17.69	1.60
Standing Level (PAL3)	33.70	57.36	8.58	32.39	56.60	8.58	35.00	57.36	15.57	-.90
Sitting Level (PAL2)	25.57	60.19	4.37	26.96	60.19	4.37	24.18	37.82	8.89	.92
Lying Down Level (PAL1)	.25	2.40	.00	.49	2.40	.00	.01	.18	.00	3.78**
<i>Motor Learning (A2) Episodes (29.17 min)</i>										
MVPA (PAL5 + PAL 4)	50.47	77.12	29.34	45.72	67.78	29.34	55.23	77.12	36.88	-3.68**
Very Active Level (PAL5)	19.12	42.56	7.76	14.62	28.16	7.86	23.62	42.56	14.38	-5.52**
Active Level (PAL4)	31.35	49.96	18.39	31.10	49.96	18.39	31.61	49.02	21.23	-.29
Standing Level (PAL3)	38.26	64.74	5.48	38.85	64.74	5.48	37.67	59.08	12.64	.34
Sitting Level (PAL2)	10.93	56.45	.00	14.77	56.45	.49	7.08	24.72	.00	2.58*
Lying Down Level (PAL1)	.34	4.73	.00	.66	4.73	.00	.02	.22	.00	3.40**
<i>Management (M) Episodes (8.13 min)</i>										
MVPA (PAL5 + PAL 4)	46.70	80.73	17.00	55.51	80.73	25.63	37.91	57.40	17.00	5.30**
Very Active Level (PAL5)	13.23	36.81	1.49	18.00	36.81	4.01	8.45	18.89	1.49	4.94**
Active Level (PAL4)	33.47	53.67	15.11	37.49	53.67	17.50	29.46	44.23	15.11	3.53**
Standing Level (PAL3)	37.37	77.05	11.30	27.03	56.64	11.30	47.71	77.05	25.71	-7.00**
Sitting Level (PAL2)	15.71	47.56	1.27	17.06	47.56	1.27	14.36	32.05	2.34	.98
Lying Down Level (PAL1)	.21	6.55	.00	.40	6.55	.00	.01	.40	.00	1.73
<i>Instruction (I) Episodes (6.46 min)</i>										
MVPA (PAL5 + PAL 4)	4.32	28.74	.00	5.63	26.40	.00	3.01	28.74	.00	1.70
Very Active Level (PAL5)	.97	7.14	.00	1.22	7.14	.00	.73	6.45	.00	1.28
Active Level (PAL4)	3.35	22.29	.00	4.42	20.80	.00	2.28	22.29	.00	1.72
Standing Level (PAL3)	12.96	61.29	.00	14.38	42.74	.00	11.54	61.29	.00	.78
Sitting Level (PAL2)	82.72	100.0	36.56	79.99	100.0	37.50	85.45	100.00	36.56	-1.25
Lying Down Level (PAL1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.
<i>Cognitive Learning (A1) Episodes (3.80 min)</i>										
MVPA (PAL5 + PAL 4)	13.37	48.00	.00	12.24	46.00	.00	14.12	48.00	.00	-58
Very Active Level (PAL5)	2.51	12.00	.00	2.65	12.00	.00	2.41	12.00	.00	.27
Active Level (PAL4)	10.86	36.00	.00	9.59	34.00	.00	11.71	36.00	.00	-.84
Standing Level (PAL3)	24.34	72.50	.00	14.05	72.50	.00	31.20	54.09	4.80	-3.38**
Sitting Level (PAL2)	62.23	99.35	9.33	73.55	99.35	13.33	54.68	88.80	9.33	2.80**
Lying Down Level (PAL1)	.06	1.22	.00	.16	1.22	.00	.00	.00	.00	2.36*

Note: \*Sig.  $\leq .05$ ; \*\*Sig.  $\leq .01$

MVPA: Moderate to Vigorous Physical Activity

During I, and A1 episodes, students were mostly engaged in passive level (averagely sitting and standing level during I and A1 episodes were 95.68% and 86.57%, respectively). In contrast, students engaged in MV-PAL were mostly happened only during A2 and M episodes (averagely MV-PAL during A2 and M episodes were 50.47% and 46.70% respectively).

### 3.3.3. Students' learning behavior (LB)

Table 3-7 shows the proportion of students' learning behavior in each of categories during 60 PE classes. As clearly seen in the table, in general, during PE classes, proportion of students who engage in learning activities during A2 episodes was averagely 42.3% (Min 11.8% and Max 72.9%). In other side, proportion of students who engage in non-learning activities was averagely 57.7% (Min 20.8% and Max 88.2%).

**Table 3-7: Proportion of learning behavior (LB) in 60 classes**

Engagement category	Proportion (%) of students		
	Ave.	Max.	Min.
Learning engagement	42.3	79.2	11.8
Direct motor learning	20.8	41.5	6.5
In-direct motor learning	10.4	41.5	0.0
Support motor learning	6.9	23.8	0.0
Knowledge	4.2	15.2	0.0
Non-learning engagement	57.7	88.2	20.8
Other than learning	56.5	82.0	20.7
Off-task	1.2	12.3	0.0

Table 3-8 on page 29 shows the proportion of students' learning behavior (LB) in each of categories during 30 Gymnastics and 30 Ball Games PE classes. As clearly seen in the table, in general, during 30 Ball Games PE classes proportion of students who engage in learning activities during A2 episodes was significantly higher than those during 30



Gymnastic PE classes ( $t = -6.2^{***}$ ). The average proportion of students who engage in learning activities during Ball Games classes was 61.5% (Min 37.4% and Max 79.2%), and in contrast, the average proportion of students who engage in learning activities during Gymnastics PE classes was 26.7% (Min 11.8% and Max 44.3%). In other side, the proportion of students who engage in non-learning activities during Gymnastics classes was significantly higher than those during Ball Games classes ( $t = 12.0^{***}$ ). The average proportion of students who engage in non-learning activities during Gymnastics PE classes was 73.3% (Min 55.7% and Max 88.2%), and in contrast, the average proportion of students who engage in non-learning activities during Ball Games PE classes was 38.5% (Min 20.8% and Max 62.6%).

**Table 3-8: Proportion of students' engagement in learning behavior (LB) categories during 30 gymnastics classes and 30 ball games classes**

Engagement category	Proportion (%) of students						t-test
	Gymnastics			Ball games			
	Ave.	Max.	Min.	Ave.	Max.	Min.	
Learning engagement	26.7	44.3	11.8	61.5	79.2	37.4	-6.2 ***
Direct motor learning	17.0	30.8	6.5	25.5	41.7	14.8	-1.8 *
In-direct motor learning	-	-	-	23.0	41.5	8.1	
Support motor learning	3.4	8.3	0.0	11.2	23.8	1.2	-5.0 ***
Knowledge	6.3	15.2	0.4	1.8	5.3	0.0	6.2 ***
Non-learning engagement	73.3	88.2	55.7	38.5	62.6	20.8	12 ***
Other than learning	71.7	82.2	55.4	58.4	58.4	20.7	11.3 ***
Off-task	1.7	12.3	0.2	0.6	4.4	0.0	3.0 **

Note: (\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$ )

### 3.3.4. Relationship between students' learning behavior (LB) during motor learning (A2) episodes and students' formative class evaluation (FCE) score toward their PE classes

As seen in table 3-9 on page 30, in each group, the percentage of engagement in learning showed significant positive relationships with

students' FCE scores ( $r = .549^{**}$  for ball games and  $r = .675^{**}$  for gymnastics). Conversely, the percentage of engagement non-learning activities showed significant negative relationships with students' FCE scores ( $r = -.549^{**}$  for ball games and  $r = -.675^{**}$  for gymnastics). Those results indicated that students' learning behaviors during A2 episodes of PE classes has close relationship with students' formative class evaluation (FCE) scores. Thus, it was reconfirmed that the momentum is one of the most important factors for producing effective PE classes (Fukugasako et al., 2003).

**Table 3-9: Correlations between students' formative class evaluation (FCE) scores and proportion of students' learning behavior (LB) categories**

Correlation		Learning Engagement				Non-Learning Engagement			
		Direct	Indirect	Cognitive	Supportive	Waiting Transition	Off-task		
FCE	60 classes	.160	.302*	-.132	.469**	.160	-.160	-.099	-.645**
	30 Ball games	.549**	.559**	.028	.196	.426*	-.549**	-.512**	-.768**
	30 Gymnastics	.675**	.361*	.	.666**	.274	-.675**	-.481**	-.837**

### 3.3.5. Relationship between proportion of students' learning behavior (LB) and proportion of students' engagement in MV-PAL

As seen in table 3-10 on page 31, proportion of students' engagement in MV-PAL during A2 episodes positively related to proportion of students who engage in learning ( $r = .548^{**}$ ), and with engagement directly in motor learning ( $r = .600^{**}$ ). In contrast, proportion of students' engagement in MV-PAL during A2 episodes negatively related to proportion of non-learning engagement ( $r = -.548^{**}$ ), and with engagement in waiting or transition ( $r = -.553^{**}$ ). These findings

indicated that number of students who engage in MV-PAL during A2 episodes has close relationship with the proportion of students who engage in learning activities. Thus, moving during A2 episodes may be a requirement for engaging in learning activities.

**Table 3-10: Correlations between proportion of students' engagement in moderate to vigorous physical activity level (MV-PAL) and proportion of students' learning behavior (LB)**

Correlation		Learning Engagement				Non-Learning Engagement			
		Direct	Indirect	Cognitive	Supportive	Waiting Transition	Off-task		
MV-PAL in A2	60 classes	.548**	.600**	.229	-.171	.171	-.548**	-.553**	-.216
	30 Ball games	.362*	.509**	.229	-.062	-.190	-.362*	-.368*	-.155
	30 Gymnastics	.486**	.476**	.	.245	-.076	-.486**	-.538**	-.087

### 3.3.6. Relationship between students' engagement in MV-PAL and students' FCE score toward their PE classes

As shown in table 3-11, in total, proportion of students who engaged in MV-PAL has positive relationship with students' FCE scores, but in A2 episodes, the proportion have no relationship with students' FCE scores (Suroto et al., 2004). The detail of the relationship could be seen in table 3-12 and 3-13 on page 32, and in table 3-14 and 3-15 on page 33.

**Table 3-11: Correlations between proportion of students' engagement in moderate to vigorous physical activity level (MV-PAL) and students' formative class evaluation (FCE) scores**

		Correlation	FCE Score
MV-PAL	In Total	60 classes	.280*
		30 Ball Games classes	.085
		30 Gymnastics classes	.464**
	In A2	60 classes	.127
		30 Ball Games classes	.185
		30 Gymnastics classes	.258
<i>Note: * = sig. ≤ 0.05; ** = sig. ≤ 0.01</i>			

**Table 3-12: Correlations between proportion of students engaged in PAL categories (during total episodes) and students' FCE score (N= 60 Classes)**

Students' FCE	Proportion of students engaged in Each PAL Categories (Per Total Episodes)		
	MVPA (Very Active & Walking) (PAL5+PAL4)	Standing (PAL3)	Sitting & Lying Down (PAL2+PAL1)
Total Score	.280*	-.014	-.210
Products	.293*	-.058	-.179
1. Impressive experience	.269*	.052	-.261*
2. Skill	.197	-.175	.011
3. Knowledge	.295*	-.060	-.184
Volition and Interest	.260*	.078	-.292*
4. Doing one's best	.255*	.114	-.324*
5. Fun	.224	.024	-.209
Way of learning	.274*	-.043	-.186
6. Spontaneous learning	.226	-.045	-.140
7. Learning for your own goal	.277*	-.034	-.200
Cooperation	.148	.028	-.127
8. Friendly manner	.171	-.083	-.034
9. Cooperative learning	.090	.121	-.169

**Table 3-13: Correlations between proportions of students engaged in PAL categories (during total episodes) and students' FCE score (split to be gymnastics and ball games classes)**

Students' FCE	Students' PAL during 30 Gymnastics Classes ( <i>Total Episodes</i> )			Students' PAL during 30 Ball Games Classes ( <i>Total Episodes</i> )		
	MVPA (Very Active & Walking) (PAL5+PAL4)	Standing (PAL3)	Sitting & Lying Down (PAL2+PAL1)	MVPA (Very Active & Walking) (PAL5+PAL4)	Standing (PAL3)	Sitting & Lying Down (PAL2+PAL1)
Total Score	.464**	.208	-.488**	.085	-.223	.191
Products	.470**	.079	-.391*	.058	-.244	.249
1. Impressive experience	.462*	.150	-.444*	.011	-.132	.154
2. Skill	.331	-.167	-.091	-.008	-.230	.304
3. Knowledge	.441*	.252	-.517**	.175	-.339	.249
Volition and Interest	.475**	.157	-.473**	.016	-.013	-.010
4. Doing one's best	.482**	.175	-.492**	.011	.049	-.089
5. Fun	.416*	.108	-.389*	-.005	-.079	.104
Way of learning	.438*	.320	-.573**	.171	-.309	.211
6. Spontaneous learning	.353	.125	-.345	.097	-.184	.128
7. Learning for your own goal	.447*	.473**	-.711***	.220	-.384*	.256
Cooperation	.264	.285	-.377*	.046	-.163	.156
8. Friendly manner	.327	.111	-.259	.072	-.181	.154
9. Cooperative learning	.172	.373*	-.392*	.006	-.107	.127

**Table 3-14: Correlations between proportion of students engaged in each PAL categories (limited only during A2 episodes) and students' FCE score (N= 60 classes)**

Students' FCE	Students' PAL during Motor Learning (A2) Episodes		
	MVPA (Very Active & Active) (PAL5+PAL4)	Standing (PAL3)	Sitting & Lying Down (PAL2+PAL1)
Total Score	.127	.094	-.213
Products	.210	.010	-.201
1. Impressive experience	.251	.065	-.297*
2. Skill	.179	-.143	-.013
3. Knowledge	.078	.094	-.169
Volition and Interest	.174	.138	-.308*
4. Doing one's best	.168	.178	-.342**
5. Fun	.149	.078	-.224
Way of learning	.025	.086	-.108
6. Spontaneous learning	.077	.065	-.131
7. Learning for your own goal	-.027	.094	-.071
Cooperation	.009	.164	-.176
8. Friendly manner	-.001	.043	-.031
9. Cooperative learning	.012	.233	-.261*

**Table 3-15: Correlations between proportions of students engaged in PAL categories (during A2 episodes) and students' FCE score (split to be gymnastics and ball games classes)**

Students' FCE	Students' PAL during 30 Gymnastics Classes (Motor Learning Episodes)			Students' PAL during 30 Ball Games Classes (Motor Learning Episodes)		
	Very Active & Active (PAL5+PAL4)	Standing (PAL3)	Sitting & Lying Down (PAL2+PAL1)	Very Active & Active (PAL5+PAL4)	Standing (PAL3)	Sitting & Lying Down (PAL2+PAL1)
Total Score	.258	.218	-.382*	.185	-.066	-.154
Products	.284	.090	-.281	.169	-.098	-.072
1. Impressive experience	.287	.165	-.348	.100	-.051	-.061
2. Skill	.158	-.190	.065	.125	-.052	-.081
3. Knowledge	.299	.292	-.486**	.263	-.180	-.047
Volition and Interest	.295	.181	-.375*	.086	-.092	-.290
4. Doing one's best	.293	.206	-.392*	.081	.151	-.392*
5. Fun	.271	.124	-.311	.062	.023	-.111
Way of learning	.225	.319	-.454*	.238	-.182	-.024
6. Spontaneous learning	.255	.136	-.293	.122	-.038	-.109
7. Learning for your own goal	.149	.459*	-.544**	.316	-.291	.054
Cooperation	.107	.298	-.348	.159	.011	-.258
8. Friendly manner	.187	.133	-.233	.143	-.061	-.097
9. Cooperative learning	.038	.371*	-.380*	.130	.074	-.335

### 3.4. Discussion

In this discussion, the findings from the first phase studies will be confronted with the hypothesis have stated in the introduction. The

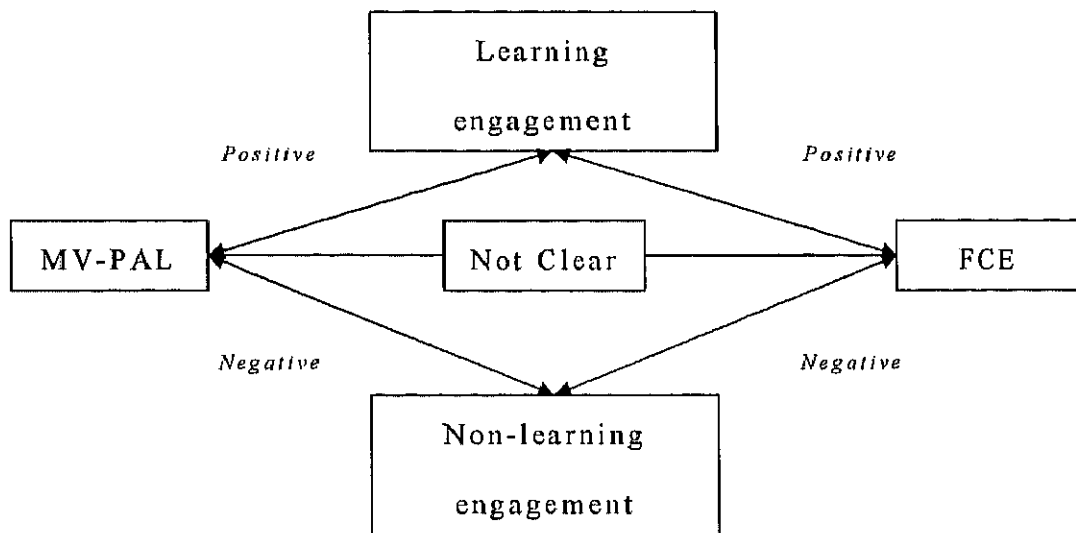
hypothesis was: in PE classes that interesting and meaningful for students, many of students learn and move enthusiastically, so that produce highly amount of learning engagements. As a result, their evaluations toward their PE classes are also high. Results from first phase studies indicated significant relationships among variables of students' FCE scores, proportion of students' engagement in learning activities during A2 episodes, and proportion of students' engagement in MV-PAL in total episodes. It means that in the Gymnastics and Ball Games units that highly evaluated by their students, there were high proportion of students who engage in learning activities and engage in MV-PAL.

But, when the focus of analysis only limited on proportion of students who engage in MV-PAL during A2 episodes, the results was not similar. Results indicated that although proportion of students who engage in MV-PAL during A2 episodes has significant relationship with proportion of students who engage in learning activities during the episodes, the proportion of MV-PAL has non-significant relationship with students' FCE scores. It means, higher proportion of students who engage in MV-PAL during A2 did not automatically followed by higher of students' evaluation toward their classes. The relationships among variables in A2 level could be visualized as shown in figure 3-1 on page 35.

There are some arguments why in the first phase studies non significant relationship found between proportion of students' engagement in MV-PAL during A2 episodes and students' FCE score. Those arguments are: (1) the units (gymnastics and ball games) more focus on students'

learning rather than students' physical activity level, therefore the significant relationship was found between students' FCE scores and proportion of engagement in learning activities; (2) the instruments for measuring students' PAL was based on only visual observation on recorded PE lesson (without back up information from more objective instrument such as pedometer).

**Figure 3-1: The relationship among students' FCE scores, proportion of students' engagement in MV-PAL during motor learning (A2) episodes, and proportion of students' engagement in learning behavior (LB) during motor learning (A2) episodes**



The diagram clearly shows that physical activity such as walking or moving very active (MV-PAL) during A2 episodes of PE class did not directly related to the effectiveness of the PE class. But, engaging in MV-PAL for learning activities during A2 episodes of PE class positively

correlated to students' FCE scores. In reverse, engaging in MVPA level for non-learning activities during A2 episodes of PE class negatively correlated to the students' FCE scores.

### **3.5. Conclusion and Recommendation**

There were three conclusions derived from the first phase studies. Those conclusions were:

- (1) The relationship between students' learning behavior (LB) during motor learning (A2) episodes and their formative class evaluation (FCE) score was significant. The FCE was positively correlated with students engagement rate in leaning activities, in reverse has significantly negative correlation with non-engagement especially off-task activities.
- (2) The relationship between students' learning behavior (LB) during motor learning (A2) episodes and their physical activity level (PAL) was also significant. MV-PAL engagement was positively correlated with engagement rate in leaning activities, in reverse, has significantly negative correlation with non-learning engagement.
- (3) The relationship between students' physical activity level during motor learning episodes (PAL) and their formative class evaluation score (FCE) was not clear.

There were three recommendations based on the findings from the first phase studies. Those recommendations were:

- (1) Engaging the more students and the more time in MV-PAL for learning purpose is an important effort for producing optimum students' PAL



and students' FCE score. Therefore, it is also important for the next study to find factors that may keep students enjoy physically active while engaged directly in learning.

- (2) It is important to check the relationship between students' FCE scores and proportion of students' engagement in MV-PAL during A2 episodes in fitness units than more producing students' MV-PAL.
- (3) It is important to use pedometer (LifeCorder) as complement for measuring students' PAL during physical education classes.