

# Research of Teachers' Embodied Knowledge: Comparison between a Mastery Teacher and a Novice Teacher in Grouping Ski Learners

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Key words : embodied knowledge, reproduced cognition, mastery teacher

## Abstract

This study explained the cognitive comparison between a mastery teacher and a novice teacher at the times of grouping in a ski lesson. Physical education is conducted in a wide space with physical movements. Therefore, cognitive abilities specific to teachers in physical education are required, such as spatial cognition, embodied knowledge about learners, cognition of class dynamism, and predictive cognition. These are the abilities different from those required of classroom teachers. Essential purpose of this study is to explain teachers' embodied knowledge.

We found that a mastery teacher recognized space and time both generally and partially in evaluating the students. The results suggests that a novice teacher recognized the class as merely mosaic of time that consist of the past, the present and the future, but a mastery teacher looked at the present awaring both space and time generally and partially. It was also found that the rate of adaptation of the learners to a class was higher in the learners grouped by a mastery teacher.

## 1. INTRODUCTION

Physical education (PE) is conducted in a wide space with physical movements. Therefore, cognitive abilities specific to teachers in physical education are required, such as spatial cognition, embodied knowledge about learners, cognition of class dynamism, and predictive cognition. These

are the abilities different from those required of classroom teachers.

Since PE teachers can evaluate the physical expressions of learners visually, even novice teachers can make a superficial evaluation with relative ease, such as "good or poor," "able to do or unable to do," and "enjoys or does not enjoy." In addition, since teaching involves physical activities more than verbal instructions, "imitating" teachers' performance seems to facilitate novice teachers' class management. It can be inferred then that mastery teachers have deeper required cognition, such as spatial cognition, embodied knowledge about learners, cognition of class dynamism, and predictive cognition, while novice teachers' cognition is superficial.

This study, therefore, compares the cognition of mastery teachers with that of novice teachers at the times of grouping in a ski lesson.

## 2. PREVIOUS RESEARCH AND RESEARCH OBJECTIVES

### 2.1 Previous Research

In the past, studies on the comparison between mastery teachers and novice teachers were conducted as part of studies on class analysis methodology.

Siedentop (1989) categorized the behavior of teachers and learners in a class and analyzed it in chronological order.

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Later, Takeo Takahashi (1996) performed a class analysis by adding a formative evaluation to Siedentop's behavioral categories of teachers and learners.

Takashi Ikuta (1998) has elucidated cognition structures of both experienced and novice teachers based on protocol data of ongoing statements and cognition of teachers in a class.

More recent studies by Tan(1998), Rovergo (2000), Chen(2001) used coded data from interviews conducted while reproducing class VTR data. All these preceding studies involve coding data during a class, coding verbal or VTR data after a class, or coding VTR-based reproduced cognition data.

## 2.2 Research Objectives

In this study, the same coding method as the preceding studies was adopted. For the study regarding the grouping in a ski lesson, data coding during a class and coding of reproduced cognition data after class based on protocol and VTR data were obtained.

## 3. METHODOLOGY

While videotaping the entire class, a CCD camera was placed on the teachers' heads to obtain their visual data.

In order to obtain reproduced cognition data in the case of grouping learners in a ski class, teachers were first asked open questions, such as "What points do you focus on when grouping learners in a ski class?" and then questions were gradually narrowed down to more specific ones, such as "Specifically when do you focus on this particular point?" Later, to tap into teachers' tacit knowledge, verbal protocol data were shown and to obtain more detailed data on physical sensations, a VTR was shown.

Where they were asked to freely give reproduced cognition on their own visual data at

30-second intervals.

Data for grouping ski learners were obtained at the time of grouping in the ski class of N university. It took place at the Greenpia Tsunan Ski Grounds in Japan on February 26 and March 1, 2005, targeting a mastery PE teacher (26 years teaching) and a novice teacher (a graduate student in the Department of Education). Data were obtained by attaching a microphone to teachers and having them record each learner's number, team name, and the reason for assigning him/her to the particular team while learners practiced walking on skis. Mastery and novice teachers recorded the contents mentioned above while learners were gliding on skis over level ground.

In addition, the teacher who was not grouping taught each groups. Then after class learners in each group were asked if the class level was right for them.

## 4. RESULTS AND DISCUSSION

### 4.1 Protocol data by grouping in a ski class

Fig.1 is the protocol data before grouping was done. The data for the novice teacher are shown on the left and that for the mastery teacher in the center.

It clearly shows that the novice teacher did not take any particular action toward learners in each situation, whereas the mastery teacher not only actively worked with them, but also checked their numbers while they were preparing for the class. (Fig.1,time:0.00-6.00)

Moreover, the mastery teacher identified experienced learners based on their behavior during the preparation phase and asked where they were from to confirm his observation (if they are from a snowy region or not). (Fig.1, time:1.30)

These observations demonstrate that the mastery teacher engages in cognitive activities for

Time	Protocol data at the time of grouping (Learner's number, team name, the reason for assigning him/her to the particular team)	
minute.second	Navice teacher	Mastery teacher
0.00		Are you middle class? Go to there having this pole.
15		Number6, 16, 11. Go to there having this pole.
30		
45		
1.00		You, have here in this pole.
15		Your ski will be hurt, Lay your ski horizontally.
30		
45		You, where do you come from? Tainai?(Snowy region)
2.00		What is your name? Kiryu? Numbe11 is Miss Kiryu.
15		Have you skied before?
30		Stick this pole.
45		Stick here and 20 meters ahead.
3.00		
15		What is your number? Number 6, OK.
30		Stick straight. Miss Kiryu, Stick more deeply.
45		
4.00		
15		Number 5, 8, come.
30		Coming here in no time will be advanced skier.
45		
4.00		
15		
30		Number 15, 22, come here, you are too late.
45		Number 26, 21, 13, come here soon.
5.00		Number 19, 17, you are too late. Come here soon.
15		Number 20, 14, 10, 7, 18, 4, they are late.
30		
45		Number 3, what your name? Put your hat on.
6.00		You have on ski here.

Fig.1. Protocol data by grouping in a ski class ( 0 - 6 minutes )

Time	Protocol data at the time of grouping (Learner's number, team name, the reason for assigning him/her to the particular team)	
minute.second	Navice teacher	Mastery teacher
45		Number 16, 16 is team 1.
8.00		Go along here. You must listen my explanation.
15	They are too late. They don't know how to move.	13-1 (Number 13 is team 1.), 12-2, 22-2, 15-2,
30	Walk this rectangle.	Keep calm.
45		21-1, 11-1, they are skillfully managing ski gear.
9.00		3-2, 19-2, 6-1, 8-2
15	Good.	5-1, slowly, 4-2,
30	Keep calm. Keep calm.	9-2, 14-2, 20-2, 10-2, 7-2,
45		18-2, He is poor at gliding on skis.
10.00	Good, Keep calm.	6-1, 8-1, 4-1, 9-1,
15	Keep your walk in a straight line.	16-1,
30		2-1, 1-2, 13-1, 12-1
45		9-1, 15-2, 21-2
11.00	3-1, He is able to skating. Numbe 11 is same movement.	Everybody looke tired.
15		3-2, 10-2
30		7-2, 16-1, 18-2
45		22-2, 17-1
12.00	14-2, He uses hands.	4-2, 11-1
15	18-2, She looks only at legs.	
30		OK, take a rest.
45		
13.00	6-1, His legs move alternately.	Next, please glide.
15	2-2, She is able to skating.	It will be clear in a few minutes.
30	It's too difficult.	
45	14-2, She looks only at legs.	4-1, 3-1, 19-1
14.00		Good.

Fig.2. Protocol data by grouping in a ski class ( 8 - 14 minutes )

grouping before he actually performs the grouping, while the novice teacher performs cognitive activities for grouping only at the time of grouping, that is, his activities for preparation, grouping, or the lesson that follows are separated from each other.

Since the mastery teacher used only two standards for grouping, which were quite intuitive, such as skillfully managing ski gear or poor at gliding on skis, he finished grouping most of the 28 learners in only about three minutes.(Fig.2, time:7.45-12.00)

On the other hand, the novice teacher completed grouping only four learners when the mastery teacher finished grouping all students. (Fig.2, time:7.45-12.15) The novice teacher used visual, superficial factors as standards for grouping, such as able to skating, uses hands, and legs move alternately, and these standards varied across students.(Fig.2,time:11.00,12.00,12.15,13.00,13.15,13.45)

Moreover, the mastery teacher conducted grouping while taking overall the spatial or time context into consideration, such as “everybody looks tired” and “it will be clear in a few minutes.” (Fig.2,time:11.00,13.15)

**4.2 Class adaptation**

Learners in each group were asked if the group level was right for them. The results showed that the percentage of learners who answered that the class was appropriate was 62.5% in the novice teacher’s class and 88.9% in the mastery teacher’s class.(Fig.3)

The results were statistically significant and showed that the accuracy of the grouping evaluation by the mastery teacher was high.

**4.3 Reproduced cognition data by grouping in a ski class**

The reproduced cognition data obtained while reading protocol data collected at the time of grouping showed that the mastery teacher

	Mastery teacher	Novice teacher
Total	45person	40person
Appropriate※1	40person	25person
Percentage	88.9%	62.5%

※※ Z=2.220 ※※:p<0.01  
 ※1)The learners who answered “I appropriated this group” after the class.

**Fig.3. Percentage of Learners who answered that the class was appropriate**

conducted grouping while confirming how much verbal instruction learners understand while engaged in physical activities, as he said, “I tried to confirm how much verbal instruction, which I gave students while they were putting on shoes, had been understood by them.”

In the reproduced cognition data obtained while watching the VTR that followed, it was made clear that the mastery teacher used the difference between their own physical movements and those of learners as a standard for grouping as well as for designing the whole lesson, as he commented, “I am checking how much learners’ movements deviate from mine while putting on my own shoes” and “I work out an overall lesson plan based on such observations.” Regarding “how to glide skis,” one of the two intuitive standards used when grouping, specific evaluation criteria were given during the reproduced cognition on VTR. The mastery teacher used the difference between their physical movements and those of learners as evaluation criteria, which turned out to be a refined deviation, such as “about 3 mm in the back and less than 1 cm in the front.”

Based on the above protocol data, reproduced cognition based on the protocol data, and reproduced cognition data on VTR, it was clear that the mastery teacher’s cognition went back and forth between the overall activities for the ski lesson and the content, space, and time of partial

activities, such as grouping. In addition, for the partial activities, the mastery teacher recognized refined movements to millimeters through deviations from his own physical activities. On the other hand, the results showed that the novice teacher's cognition was superficial since he used visual standards for grouping and that he had a cognition structure where grouping, preparation, and lesson activities were separated from each other, and the aggregation of these separated elements constituted the total lesson.

It was also found that the reproduced cognition data on VTR could draw out data of physical sensation and refined cognition better than the reproduced cognition data obtained by reading protocol data.

## 5. CONCLUSION

Compared to the reproduced cognition data obtained while watching VTR images depicting the entire learning space, the reproduced cognition on CCD camera images can reproduce a class more realistically, as exemplified in the teacher's frequent comment of "I'm watching here," and therefore is effective in bringing out more specific statements of cognition.

In addition, even when the signified meaning of the approach is corrective or negative, its meaning is not expressed directly, but rather by replacing it with a positive approach, the teacher strives to maintain the class dynamism.

## NOTE

This research include our presentation study on British Educational Research Association Annual Conference 2005 in Glamorgan University(UK).

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