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Learning Strategies of Students in Physical Education Classes

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Interest to study students' use of strategies for learning stems from the assumption that students are active agents for learning, and as such, an understanding of their cognitive involvement could provide some insight into developing approaches to maximize learning and performance. In the learning of subject matters other than physical education, researchers had already begun to examine students' learning strategies as the mediator between teacher behaviour and student achievement. However, in the subject matter of physical education, research is comparatively sparse. Therefore, in an attempt to fill the void, this study aimed to obtain a profile of learning strategies used by students in physical education classes.

The study involved two phases. The first phase involved the development of a paper-pencil instrument (LSinPE) to assess students' use of learning strategies in PE class. A correlation of 0.70 to 0.98 was obtained from the 16 behavioural items. The second phase involved administrating the questionnaire to 320 students (13-14 years old) enrolled in PE classes. It was found that students enrolled in the more focused PE Class (8 hours/week) were able to apply deep strategy for consolidating learning than the regular class (2 hours/week). It was concluded that the selection of learning strategy (surface or deep) was hinged on the students' perceived value of the task to be learnt and that teachers should structure activities which can foster value clarification processes among students.

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Introduction

The three stage model of memory proposed by Atkinson and Shiffrin (1971) lays the foundation for studying the process of learning. Cast within the theoretical framework of the Atkinson-Shiffrin model, learning represents the successful transmission of information from the stage of sensory register to the stage of short-term memory and, eventually, to the stage of long-term memory. Throughout this process, learners are seen as active participants who are able to employ strategies to aid effective transmission of information along the stages. For example, in the process of selection, learners could employ the strategy of actively paying attention to the information that is impinging on their receptors and then, by means of basic or complex rehearsal strategies, transfer it into the working memory. In the acquisition stage, learners could actively transfer the information from their working memory into their long-term memory through applying strategies such as comprehension, organisation, elaboration, association and integration (Mayer, 1984).

Interest to study students' use of strategies for learning stems from the assumption that students are active agents for learning, and as such, an understanding of their cognitive involvement could provide some insight into developing teaching approaches which could maximize learning. In the learning of subject matters other than physical education, researchers had already began to examine students' learning strategies as the mediator between teacher behaviour and student achievement. For example, Brooks and Dansereau (1983) found a positive relationship between students' application of the strategy "organisation" and their prose processing performance. Similarly, Peterson, Swing, Stark, and Waas (1984) studied students' self report of thought processes during mathematics instruction and found that students' level of attention and engagement in learning strategies were related to learning outcomes.

Investigating students' use of learning strategies for skill acquisition during physical education classes is still at a stage of infancy. Gong, Hu, and Lew (1997) compared preferences of learning strategies employed by Asian and Caucasian students when learning skills in physical education classes and found that cultural differences was not an important factor in dictating students' selection of learning strategies. Solomon and Lee (1996) examined the relative importance of factors such as students' entry characteristics, ability in error detection, use of strategies, attention level, and motivation in influencing a group of sixth-grade students in their learning of a motor skill and found that attention was positively related to achievement. They also concluded that the students were aware of their own cognitive processes and were able to report them with accuracy. However, in another study, findings were not as encouraging. Chapman (1996) interviewed a group of 10-year-olds to find out how they learn skills in physical education classes and found that the children thought that they could learn a skill by simply repeating it many times. Furthermore, the children expressed that if they make any improvements, it was "as if by magic" (p.15) and that when one person performs better than another, it was "because the better person was older or bigger in size" (p.15). Clearly, this study showed that students of that physical education class did not know how learning took place, or the fact that there were cognitive strategies which, when employed, would help them learn more effectively. Given such inconsistent findings and the paucity of this type of research in the field of physical education, continued effort to examine students' use of cognitive strategies in physical education classes is warranted.

Biggs (1992) used the term "surface strategies" and "deep strategies" to describe students' approaches to learning. He posited that when students avoid "planning, monitoring, and in-depth involvement with the task" in a given learning situation, they are using the surface strategy approach to learning. Conversely, when students actively search for "analogies, relating to previous knowledge ... and, deriving extensions and exceptions" (pp. 10-11), they are using deep strategies. Typically, surface strategies are used

when the students are more interested in "getting the task out of the way" and "meeting teacher's minimal requirements" whereas deep strategies are used when the students feel that the learning is "personally significant". This suggested that the type of strategies employed by students is closely related to their motivation to learn and to their interest in the subject matter. In Hong Kong, where physical education classes are not widely seen as opportunities for serious learning and where regular physical activity participation is not common, one wonders whether students in those classes perceive themselves as active agents of learning and whether they consciously employ deep strategies to help themselves learn more effectively. The pressing need to find some answers to such queries has been raised by Housner and French (1994) who stressed that one central purpose for future research for physical educators would be to identify knowledge and cognitive skills that underlie expertise in the learning, performance, and instruction of sport and physical activity" (p. 246), and Lee (1997) who pointed out that "if we view the world through the eyes of our students and hear the messages embedded in their actions, we will learn things we never knew we did not know" (p. 274). With this in mind, a two-phased study was designed to achieve the following objectives: 1) to develop an instrument to assess learning strategies used by students in physical education classes and, 2) to compare learning strategies used by students who have selected physical education as a special area of study with those who participated in physical education as part of the normal school curriculum.

Phase One

The purpose of phase one of the study was to develop a paper-pencil instrument used for assessing students' use of learning strategies in physical education classes. The procedures and results are presented below.

Procedures

Instrument development

The instrument used for the study was developed through a series of steps. In the first instant, questions related to the research problem were raised. These questions were: 1) What were the students doing when the teacher was demonstrating and/or instructing? 2) What did the students do when asked to practice? 3) What did the students do with the information passed on to them after the class? From these questions, a pool of possible behaviours was generated from several sources including related literature, informal interviews with teachers, and input from students. Then, from this pool of initial behaviours, potential behaviours were selected by a panel of 3 teachers who screened them for inclusiveness, redundancy and validity. Finally, the 16 selected behaviours with 4 possible responses to each behavioural item were tested on a group of 3 students aged 11 to 13 for appropriate reading level. Possible responses to each behavioural item were "very much like me", "like me", "somewhat not like me", and "not like me at all". Comments from the 3 students suggested that no further language modification was necessary.

This 16-behavioural item questionnaire, referred to from hereon as "Learning Strategies in Physical Education" (LSinPE), was subjected to a test-retest reliability check. Data for this test was obtained from 36 students who participated on a voluntary basis. The test-retest interval was 7 days. Pearson Product Moment Correlation coefficients of the 16 behavioural items ranged from .70 to .98 and therefore the stability of the questionnaire was deemed acceptable.

Data Collection

Participants in this phase of the study were students from a secondary school in Hong Kong. A total of 210 students aged between 11 to 12 years were involved. The questionnaire was in English and the Class teacher was briefed and would clarify items to students if needed.

After obtaining consent to conduct the study, the LSinPE was given to students to complete during class by a class teacher. The students were told that there were no right or wrong answers, that they should not discuss the responses with anyone, that no names would be attached to the responses, and that no one from the school would see their responses. It was also stressed to them that they should read the questions carefully and answer according to how they would act most of the time.

Results

Exploratory Factor Analysis

Prior to further analysis, the 16-behavioural item questionnaire was submitted to principal axis factor analysis with direct oblimin rotation. Three factors were obtained as indicated by the scree plot. The eigenvalues for the three factors were 4.63, 1.27, and 0.62. Together they accounted for 40.9% of the total variance. Of the three factors, two contained behavioural items which were clearly related to learning strategies which Biggs (1992) described as "Deep Strategies" whereas the behavioural items of the other factor fitted his descriptions for "Surface Strategies". In view of this, these factors were named "Deep Strategies Used for Learning", "Deep Strategies Used for Consolidating Learning", and "Surface Strategies" respectively. The factors, factor items, and loadings are presented in Table 1.

The first factor, termed "Surface Strategies" contains 6 behavioural items. These behaviours included: looking at other students aimlessly and only start to practice when the teacher is looking and talking with other students when the teacher is talking or demonstrating. Of the six items, five loaded well (loading >.30) onto the factor. The item "practise immediately but not thinking much about how to do it" had a poor loading of .24. Therefore it was decided that this item will be deleted in the final version of the LSin PE. The second factor "Deep Strategies Used for Learning" contains 6 behavioural items and reflected students' use of self-monitoring strategies while learning. These strategies included: self-checking for understanding before beginning to practice, reminding self of what needs to be done while

Table 1 Factor items and loadings of the LSin PE

Items		Factor 1	Factor 2	Factor 3
1.	Looks at teacher but thinks about other un-related matters	.75		
2.	Casually looks and listened but not really seeing or hearing	.71		
3.	Looking at other students aimlessly and only start to practise when teacher is looking	.60		
4.	Talk with other students when teacher is talking or demonstrating	.51		
5.	Forget what has been taught until the next class	.51		
6.	Practise immediately but not thinking much about how to do it	.24		
7.	Try to remember corrective feedbacks from teacher		.58	
8.	Reminding self of important points while practising		.56	
9.	Watch and listen carefully when teacher is talking and demonstrating		.53	
10.	Self check for understanding before beginning to practise		.47	
11.	Watch how it is done by other students then copy them		.44	
12.	While waiting for turn, evaluate whether other students are doing it correctly or not		.33	
13.	Rehearse in mind in spare time so as to remember better			.77
14.	Find out more about the skill by asking others or by self			.71
15.	Find others to practise with or practise on own			.69
16.	Try to associate new learning with previously learnt skill			.52
Variance explained:		32.4%	11.5%	7.5%

Note: Factor 1: Surface strategies
Factor 2: Deep strategies used for learning
Factor 3: Deep strategies used for consolidating learning

practising, and paying attention when teacher is talking and demonstrating. Four behvioural items loaded onto the third factor of "Deep Strategies Used for Consolidating Learning". The focus of the behaviours included strategies such as: practising the skill during spare time, thinking over what was taught so as to remember better, and trying to associate new learning with previously learnt skill.

Internal Consistency of the LSinPE

The internal consistency estimates for each sub-scale (factor) of the LSinPE was obtained by means of calculating the Cronbach's alpha coefficients. The resulting coefficients were .78 for "Deep Strategies Used for Learning", .77 for "Deep Strategies Used for Consolidating Learning", and .74 for "Surface Strategies". Given these alpha coefficients, the internal consistency of the LSinPE was deemed acceptable.

Phase Two

The purpose of phase two of the study was to test whether students who differed with respect to the curriculum they have selected exhibit significantly different learning strategy profiles.

Method

Participants

For phase two, 320 students (aged between 13 and 14) from the same secondary school were involved. Of the 320 students, 164 took part in physical education classes as part of the normal curriculum and 156 elected physical education as a special area of concentration. The former group of students will be referred to as the "non-focused group" (NFG) whereas the latter group will be referred to as the "focused group" (FG) from hereon. Both groups of students were aged between 13 and 14.

In all cases, the male students were taught by the same male physical education teacher whereas the female students were taught by the same female physical education teacher. In terms of the number of hours of

instruction, FG students received eight physical education classes each of 40 minutes duration a week whereas NFG students received two physical education classes each of 40 minutes duration a week. Students opted to elect physical education as an area of concentration mainly because of their interest in physical education. However, to be accepted, they were required to pass a fitness test and to have had some record of taking part in organised sports.

Instrument

Instruments used for data collection were the LSinPE and a demographic data form which also contained 10 items related to self-efficacy beliefs about skills taught in physical education classes, value-orientations about physical education, and personal aspirations in sports.

Results

The means and standard deviations of the 15 behavioural items in the LSinPE and the 10 accompanying items on self-efficacy, value-orientations, and personal aspirations are presented in Table 2. To test whether FG and NFG students differ with respect to usage of learning strategies in physical education classes, a between group MANOVA was applied to the three factors of the LSinPE. Results suggested that there was a significant difference between the two groups (Wilks' Lambda = .90, $F = 10.53$, $p < .05$, ES = .10). Subsequent Roy-Bargman Stepdown F test suggested that Factor 3 (Deep Strategies Used for Consolidating Learning) was the most responsible factor for the obtained overall group difference effect (see Table 3).

With respect to the 10 accompanying items relating to self-efficacy, value-orientations, and personal aspirations, the two groups were also found to be significantly different in items related to value-orientations and personal aspirations. As compared to the NFG students, FG students gave higher ratings to physical education in terms of its contribution to health and as having content and information worthwhile for learning. FG students also expressed a greater liking for physical education as a subject and a greater

Table 2 Means and standard deviations of items in the LSin PE

	FG Students (n=156)		NFG Students (n=164)	
	Mean	SD	Mean	SD
LSinPE Factor 1:				
1. Looks at teacher but thinks about other un-related matters	2.10	0.79	2.14	0.79
2. Casually looks and listened but not really seeing or hearing	1.94	0.68	2.14	0.78
3. Looking at other students aimlessly and only start to practise when teacher is looking	2.17	0.75	2.29	0.92
4. Talk with other students when teacher is talking or demonstrating	2.34	0.80	2.58	0.85
5. Forget what has been taught until the next class	1.87	0.75	2.39	0.96
LSinPE Factor 2:				
6. Try to remember corrective feedbacks from teacher	3.26	0.70	3.10	0.76
7. Reminding self of important points while practising	3.02	0.82	2.73	0.84
8. Watch and listen carefully when teacher is talking and demonstrating	3.10	0.69	2.92	0.78
9. Self check for understanding before beginning to practise	2.98	0.72	2.67	0.73
10. Watch how it is done by other students then copy them	2.94	0.75	2.85	0.83
11. While waiting for turn, evaluate whether other students are doing it correctly or not	2.98	0.84	2.78	0.97
LSinPE Factor 3:				
12. Rehearse in mind in spare time so as to remember better	2.47	0.74	2.04	0.78
13. Find out more about the skill by asking others or by self	2.19	0.87	1.83	0.88
14. Find others to practise with or practise on own	2.09	0.88	1.70	0.77
15. Try to associate new learning with previously learnt skill	2.61	0.83	2.23	0.91

Table 2 (cont'd)

	FG Students (n=156)		NFG Students (n=164)	
	Mean	SD	Mean	SD
The 10 accompanying items:				
1. Physical education is the subject you like best	3.38	0.84	2.59	1.11
2. If possible, you will rather exercise than do other activities, for example like playing the piano or painting	2.70	1.08	2.16	0.98
3. In physical education classes, you think you are better than other students in your class	2.09	0.79	1.87	0.78
4. You wish to become a high performance athlete, so that you can represent the school or Hong Kong	3.03	0.95	1.86	0.98
5. After watching the teacher demonstrate, your normally think "I can do that"	2.80	0.86	2.32	0.92
6. You think everybody should exercise regularly	3.38	0.84	3.12	0.79
7. You think that in physical education, there are important things to learn, just like in other subjects	3.39	0.75	2.82	0.92
8. Even though the teacher has showed you how to do it, you still think "I can't do it well"	2.43	0.68	2.45	0.88
9. You cannot do certain skills because you think they are very difficult	2.34	0.82	2.43	0.86
10. You think that exercise can keep you healthy	3.55	0.69	3.17	0.81

Note: Item score ranges between 1 to 4 with a higher score indicating a stronger agreement with the item.

Table 3 Result of Roy-Bargman Stepdown F tests

Factor	MS Error	Hypothesised DF	DF Error	Stepdown F
3	6.37	1	308	30.27*
2	7.01	1	307	0.08
1	8.51	1	306	1.32

* $p < .05$

Note: Factor 3: Deep Strategies Used for Consolidating Learning
Factor 2: Deep Strategies Used for Learning
Factor 1: Surface Strategies

Table 4 Independent t-test results of the accompanying items

		FG Students		NFG Students		
	Items	Mean	SD	Mean	SD	t
1.	Physical education is the subject you like best	3.38	0.84	2.59	1.11	6.98*
2.	If possible, you will rather exercise than do other activities, for example like playing the piano or painting	2.70	1.08	2.16	0.98	4.60*
3.	In physical education classes, you think you are better than other students in your class	2.09	0.79	1.87	0.78	2.76
4.	You wish to become a high performance athlete, so that you can represent the school or Hong Kong	3.03	0.95	1.86	0.98	10.89*
5.	After watching the teacher demonstrate, your normally think "I can do that"	2.80	0.86	2.32	0.92	4.78*
6.	You think everybody should exercise regularly	3.38	0.84	3.12	0.79	2.64
7.	You think that in physical education, there are important things to learn, just like in other subjects	3.39	0.75	2.82	0.92	5.71*
8.	Even though the teacher has showed you how to do it, you still think "I can't do it well"	2.43	0.68	2.45	0.88	-.43
9.	You cannot do certain skills because you think they are very difficult	2.34	0.82	2.43	0.86	-.83
10.	You think that exercise can keep you healthy	3.55	0.69	3.17	0.81	4.60*

* $p < .001$

interest to become an athlete representing the school or Hong Kong. Results of the independent t-test are presented in Table 4.

Discussion

The purpose of this study was to obtain a profile of learning strategies used by students in physical education classes. Biggs (1992) suggested that students could employ deep or surface strategies while learning. Behaviours associated with use of deep learning strategies include those of making connections between old and new material, actively engaging in memorization,

and attending to teacher's instruction. Behaviours associated with surface learning strategies included those of inattentiveness and adopting a satisfying approach to tasks on hand. Students' choice of learning strategies might be related to a number of reasons, more prominent individual differences are those associated with cognitive development and motivation.

From a cognitive development perspective, cognitive abilities associated with knowledge about learning strategies fall under the umbrella term of "metacognition" (cf. Flavell, 1979). Shuell (1986) proposed two types of metacognitive processes, one type helps to regulate activities necessary for learning and the other is concerned with the extent to which learners know about the material to be learnt and the processes involved in learning it. Developmental psychologists pointed out that, under typical developmental conditions, children's intention to remember appears at an early age. Apple, Cooper, McCarrell, Sims-Knight, and Flavell (1972) mapped this ability against chronological age and suggested that children are able to demonstrate the intention to remember as young as six or seven years of age. However, more recent research such as that by Fabricius and Cavalier (1989) showed that children as young as four years of age were able to point out strategies that help them recall. To some extent this notion is supported by Kluwe (1990) who suggested that the development of the conscious accessibility of knowledge in children is between age 5 and age 7. Therefore, it appears that children's intention to remember as well as their ability to employ learning strategies are already present at that age. Following this, it would be reasonable to suggest that motivational rather than developmental factors are responsible for employment of learning strategies among the 13- to 14-year-old participants of this study.

From a general motivational perspective, it would be rational to argue that students who opted to elect physical education as an area of concentration would be more likely to employ deep learning strategies than those who participated in physical education because it is part of the school curriculum. This group of students would be sitting for the HKCEE PE subject in 3 years. Their motivation to learn the "subject matter" more

seriously would support Chapman's findings (1966) on the perception of the learning process. This could also be the result of the motivation to achieve as suggested by Solomon and Lee (1996). Results of the MANOVA and subsequent univariate tests indeed supported this notion. FG students were found to differ from NFG students particularly in behavioural items associated with approaches to consolidate the materials learnt. FG students were also more likely to use deep learning strategies such as those of self-monitoring while learning.

In trying to explain the effect of motivational forces related to students' cognitive engagement in academic tasks, Pintrich and Schrauben (1992) presented an integrated model which might also be applicable to the type of learning that takes place in physical education classes. The model describes the interactive relationship between motivation and cognitive components and suggested that the two jointly influence students' involvement in learning. Motivation components such as "affect", "expectancy", and "value" are seen as important factors. Affect factors include the individuals' emotional reactions to the task and their emotional needs in terms of self-esteem. Expectancy factors are those associated with the individuals' beliefs about their "ability to perform a task, their judgements of self-efficacy and control, and their expectancy for success at the task" (p.154), whereas value factors are concerned with "the individuals' goals for engaging in a task as well as their beliefs about the importance, utility, or interest of a task" (p.155). In this study, whereas NFG and FG students were found to have similar levels of self-efficacy in skill acquisition and performance, they were found to differ in the value-orientation aspect of motivation; the FG students' preferences for physical education as a subject were greater and their ratings on the value of physical education in general were also higher. Research such as those by Eccles, Adler, Futterman, Goff, Kaczala, Meece, and Midgley (1983) and Pokay and Blumenfeld (1990) suggested that students' perceived value of a task stems from their perceptions of the importance of the task to them and the potential usefulness of that task in the future. Therefore, from the practice point of view, in order to encourage students employ deep learn-

ing strategies in physical education classes, it is first necessary to point out to them the importance and utility of physical education, namely helping them identify specific personal needs and then helping them formulate activities in physical education that can address those needs.

Research such as those by Battle (1957) and Rath, Harmin, and Simon (1966) suggested that a principal way to help students formulate values is through a value clarification process in which the teacher responds to students' value statements with non-judgemental comments. They also pointed out that this process encourages students to make reflections on their own value statements and actions. Perkins (1974) further added that students can learn to formulate values through identification with a significant other who serves as a model, and that the effectiveness of the value clarification process could be enhanced if the model is also a participant.

In conclusion, this study, through examining learning strategies used by students in physical education classes, had identified possible factors which might deter their employment of deep learning strategies associated with effective learning. From evidence gathered in this study, it would appear that selection of learning strategies is hinged on learner's perceived value of the task to be learnt. Thus, an important element that physical educators need to attend to is to structure activities that can foster value clarification processes among students.

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