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RESEARCH NOTE

Self-Regulation, Motivation and Teaching Styles in Physical Education Classes: An Intervention Study

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The aim of the study was to investigate the influence of student-activated teaching styles through a specific intervention program on students' self-regulation, lesson satisfaction, and motivation. Six hundred and one 7th grade students (318 boys and 283 girls), aged 13 years were randomly assigned to an experimental group and a comparison group. The teachers who taught the students assigned to the experimental group used student-activated teaching styles, and specifically the reciprocal, self-check, inclusion, guided discovery, convergent discovery, and divergent discovery styles. Repeated measures analysis of variance revealed that the experimental group, compared with the comparison group, had higher scores in lesson satisfaction, intrinsic motivation, identified regulation, and metacognitive activities, and lower scores in external motivation, and amotivation. The study revealed that going beyond the command and/or the practice style of teaching, PE teachers can enhance students' metacognitive skills, lesson satisfaction and intrinsic motivation.

Keywords: student-activated teaching styles, metacognition, lesson satisfaction, motivation.

Educators and psychologists have indicated the significance of motivation and self-regulation in academic achievement (Zimmerman, 2001, as cited in Zimmerman, 2002). Self-regulated students are characterized as metacognitively, motivationally, and behaviorally active participants in their own learning (Zimmerman, 1986).

The metacognitive process includes two components: knowledge about cognition and regulation of cognition. Knowledge of cognition includes declarative, procedural, and conditional knowledge, which means how, when, and why an individual uses the appropriate strategies for successful performances (Hartman, 2002). Regulation of cognition includes activities that are aimed to control learn-

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ing such as planning, information management, monitoring, self-evaluation, and revising (Hartman, 2002).

In sports, declarative knowledge includes knowledge about a specific task, which means what to do in a situation. Procedural knowledge is the knowledge of how to perform a specific task, such as, how to play a backhand volley in tennis. Researchers support the notion that expert players differ from novice ones in declarative, procedural, conditional and strategic knowledge (McPherson, 1994).

In terms of motivational processes, self-regulated students report higher intrinsic motivation, which is based on taking pleasure in an activity, excitement of doing so, effort and persistence during learning (Niemiec & Ryan, 2009). Concerning behavioral processes, these students create environments for successful learning using help-seeking methods and self-instruction during performance (Zimmerman & Martinez-Pons, 1986).

Studies on self-regulated learning suggest that classroom instructional practices can be implemented to develop self-regulating students (Pintrich & DeGroot, 1990). Although researchers have studied metacognitive processes in classroom settings (Chatzipanteli & Digelidis, 2011; Iskala, Vauras, & Lehtinen, 2004; Theodosiou & Papaioannou, 2006), no studies could be found that examined the impact of different teaching styles on metacognitive processes in physical education classes.

According to Spectrum theory (Mosston & Ashworth, 2002), teaching styles can be categorized in two main clusters (reproduction or production). Productive teaching styles, have been characterized as student-activated ones because students employ an active role in their own learning process (Struyven, Dochy, & Janssens, 2010). Student-centered learning is supportive of students' cognitive learning (Byra, 2006), helps students to develop positive attitudes toward physical activity (Stylianou, Kulinna, Cothran, & Kwon, 2013), and influences learners' interest, helping them to engage in the same or similar activities in the future (Himberg, Hutchinson, & Roussell, 2003). Hence, it is worth examining if a variety of teaching styles can promote self-regulation in physical education classes. Although researchers report that both genders use their metacognitive knowledge and skills in learning (Ciascai & Lavinia, 2011), it was deemed useful to explore potential gender differences in this context in Greece as well.

Therefore, the purpose of this study was to investigate the effectiveness of a variety of student-activated teaching approaches in influencing students' self-regulation and, more specifically, metacognitive and motivational processes in physical education classes. It was hypothesized that elements of self-regulated learning: (a) metacognitive activities and (b) motivation and lesson satisfaction could be developed by a combination of student—activated teaching styles.

Method

Participants and Setting

A total of 601 7th grade students (318 boys and 283 girls) aged 13 years old participated in this study. This study involved 32 classes from eight different urban schools of Central Macedonia prefecture, Greece. With random assignment, four schools consisted of the experimental group (316; 174 boys and 142 girls) and the other four schools were in the comparison group (285; 144 boys and 141 girls),

that is, 16 classes in each condition. Participants had no previous experiences with student-activated teaching styles (C, D, E, F, G and H). Permission for the study was granted from the Greek Pedagogical Institute in conjunction with school authorities and informed consent was signed by students' parents. All students participated voluntarily.

Measures

There were two waves of measurement: (a) before the start of the intervention and (b) at the end of the 16-week period of the intervention. In each wave, participants completed the questionnaires during regular school hours under the supervision of one of the researchers. The completion of the questionnaires lasted approximately 45 min. The following three measures were used in the study.

Metacognitive Process in Physical Education Questionnaire. The Metacognitive Process in Physical Education Questionnaire was used to assess students' metacognition. This instrument was developed by Theodosiou and Papaioannou (2006) and it is based on Brown's 1987, as cited in Theodosiou and Papaioannou, 2006) framework. The questionnaire has nine scales -declarative knowledge, procedural knowledge, conditional knowledge, information management, planning, self-monitoring, debugging strategies, evaluation, and mental imagery- and 52 items and its construct validity and reliability had been shown in previous studies with similar participant groups (Theodosiou & Papaioannou, 2006). Example items for each scale can be found in Table 1. Responses were recorded on a five-point Likert-type scale grading from strongly agree = 5 to strongly disagree =1. Theodosiou and Papaioannou (2006) indicated very good indices of fit for the 9 factors model: $\chi^2(1238) = 2616$, $p < .001$, Tucker Lewis Index (TLI) = .91, Comparative Fit Index (CFI) = .92, Root Mean Square Error of Approximation (RMSEA) = .04. Indeed, Confirmatory Factor Analysis based on the present data supported the 9-factor structure again: $\chi^2(1238) = 2170$, TLI = .92, CFI = .92, RMSEA = .03. The alpha internal consistency reliabilities in the current study were .76, .75, .83, .82, .81, .72, .85, 86, and .89 for declarative, procedural, conditional knowledge, information management, planning, self-monitoring, debugging strategies, evaluation, and mental imagery, respectively.

Intrinsic and Extrinsic Motivation at the Contextual Level. This scale was initially developed by Guay, Vallerand, and Blanchard (2000), and has been adapted for the Greek population by Papaioannou, Milosis, Kosmidou, and Tsigilis (2007). This questionnaire includes four subscales and each subscale is comprised of four items. Under the general stem: "Why do you participate in PE activities?", students responded to the four subscales: (a) intrinsic motivation (e.g., "...because I believe that they are interesting"), (b) identified regulation (e.g., "...I do them for my own good"), (c) extrinsic motivation (e.g., "...because I had to do it"), and (d) amotivation (e.g., "...I don't really know. I really have the impression that I am wasting my time"). Responses were given also on a five-point Likert-type scale ranging from strongly agree (=5) to strongly disagree (=1). The validation study for the Greek population conducted by Papaioannou et al. (2007) regarding the intrinsic-extrinsic motivation measure revealed the following goodness-of-fit indices for the 4-factor model (intrinsic, identified, external, amotivation): χ^2 (98) = 332, p<.001, TLI =

Table 1 Metacognitive Process in Physical Education Questionnaire (Theodosiou & Papaioannou, 2006)

Metacognitive activities	Items
1. Declarative knowledge (six items)	e.g.,"…I realized which exercises I could perform right"
2. Procedural knowledge (six items)	e.g., "… I had a clear view of how to put in practice a learning method I have been taught"
3. Conditional knowledge (five items)	e.g., "… when I wanted to grow better in a game I put into practice a learning strategy"
4. Information management (six items)	e.g., "… I thought if the games I played were similar to others"
5. Planning (four items)	e.g., "…it is clear for me what I want to learn"
6. Self-monitoring (four items)	e.g., "…the moment I perform an exercise, I check if I actually learned it right"
7. Problem solving strategies (seven items)	e.g., "… when I got confused I stopped to see the whole thing from the beginning"
8. Evaluation (seven items)	e.g., "… since I have learned an exercise I compared the way I had learned it with other ways"
9. Imagery (seven items)	e.g., "… before I perform an exercise I imagined myself to performing it"

.89, CFI = .91, RMSEA = .06. In the current study, the data did not fit well to the original 4-factor structure with each factor consisting of 4 items: χ^2 (98) = 549, p<.001, TLI = .84, CFI = .87, RMSEA = .09. Based on results from modification indices, two items on the external regulation scale were deleted ("because I didn't have any choice" and "because I feel I have to do it"). These items may express different level of perceived external control than the two items that we retained ("I am supposed to do it" and "it is something that I have to do it"). For the new 4-factor structure that consisted of 14 items, the goodness of fit indices, were acceptable: χ^2 (71) = 258, p<.001, TLI = .92, CFI = .94, RMSEA = .06. The alpha internal consistency reliabilities were .76, .68, .75 and .73 for intrinsic motivation, identified regulation, external regulation (2-item scale), and amotivation, respectively.

Lesson Satisfaction Scale at the Contextual Level. This scale was developed by Duda and Nicholls (1992) and has been adapted for the Greek population by Papaioannou et al. (2007). The scale is suitable for measuring students' lesson satisfaction in PE. It is one-dimensional and comprised of five items. Some item examples are: "I think that PE lessons are very interesting", "I enjoy taking part in the PE lessons", "I find that time flies when I am taking part in the PE activities". Students responded on a 5-point Likert-type scale ranging from strongly agree (=5) to strongly disagree (=1). In the current study, the original 5-item factor yielded the

following goodness of fit indices, χ^2 (5) = 31, p<.001, TLI = .91, CFI = .94, RMSEA = .09. Based on results from modification indices the fourth item (have fun) was removed. In Greek language, the word "fun" is linked with task-involvement but is also connected with leisure activity experiences, which might not fit well with learning experiences in school. For the new 4-item one-factor structure, the goodness of fit indices, were practically perfect: χ^2 (2) = 3.5, p=.169, TLI = .99, CFI = 1.00, RMSEA = .03. The alpha internal consistency reliability for the 4-item scale was .68.

Intervention and Educational Materials

The intervention program lasted 16 weeks. The educational material for the experimental group of teachers, which were prepared by the researchers, consisted of: (i) 38 lesson plans and (ii) students' workbooks with the criteria sheets or task cards for a variety of teaching styles.

The content of the educational material consisted of eight lesson plans for basketball, eight for volleyball, six for soccer, eight for track and field unit, five for fitness enhancement, and three for gymnastics (see Table 2). The same content was taught in the comparison group as required by the school district curriculum. The only difference was that educators in the experimental group focused on how to implement the teaching styles. Instructions were provided to them to carry out the criteria of each teaching style in the two 4-hour training sessions.

Use of Teaching Styles. In the reciprocal teaching style, students were organized in pairs and gave feedback to each other by using a criterion form (e.g., read carefully the criteria sheet for successful performance: your peer can execute the motor skill and afterward you can check his/her execution). In the self-check style, students had to read the criteria sheet for successful performance, execute and check their execution. Information regarding the use of teaching styles in each lesson is presented in Table 2.

In the inclusion teaching style, the teacher's role is to prepare the tasks and the levels of difficulty and students have the responsibility to decide which execution is according to their level (performance plan), execute, monitor their performance, and reflect in tasks of increasing levels of difficulty. The guided discovery and convergent teaching styles were used to help students plan and reflect on their performances under the teacher's guidance, while the divergent teaching style was used to help students to plan their performances.

Procedures and Intervention Design

According to the Greek PE curriculum, 7th grade students have three teaching hours per week (45 minutes each). Both experimental and comparison groups were taught similar content. There was no intervention in the comparison group nor were any teaching guidelines given. The content of the educational material is presented in Table 2.

A total of ten existing PE teachers of Greek nationality, provided the instruction in their schools. Five teachers (3 men and 2 women), with teaching experience (M = 20.8 years, SD = ± 2.58), instructed in the comparison group. The other five teachers (4 men and 1 woman) with teaching experience (M = 11.4 years, SD = ± 4.39 years) who taught the intervention program classes had no previous experience

Table 2 Applied Teaching Styles and Educational Content

Lesson number	Combination of teaching styles	Teaching styles applied in experimental group	Educational content for both groups, according to curriculum
Basketball unit			
1	2	Inclusion & guided discovery	Athletic-movement skills
2	3	Self-check, guided discovery & convergent	Basic passes
3	2	Guided discovery & convergent	Defense
4	4	Reciprocal, self-check, guided discovery & convergent	Dribbling
5	2	Self-check & guided discovery	Pivot- spacing concepts
6	2	Inclusion & divergent	Shooting form
7	3	Reciprocal, self-check & convergent	Jump stop
8	2	Inclusion and self-check	Lay up
Volleyball unit			
9	2	Guided discovery & convergent	Spacing concepts
10	2	Guided discovery & convergent	Movement skills
11	4	Inclusion, reciprocal, self-check and convergent	Overhand pass
12	4	Inclusion, reciprocal, self-check and convergent	Forearm pass
13	3	Guided discovery, convergent and divergent	Overhand and forearm passes
14	4	Inclusion, self-check, guided discovery and convergent	Underhand serve
15	4	Inclusion, reciprocal, self-check and convergent	Overhand serve
16	3	Guided discovery, convergent and divergent	Receiving skills
Soccer unit			
17	2	Reciprocal and guided discovery	Ball control
18	3	Reciprocal, self-check and guided discovery	Passing skills

Lesson number	Combination of teaching styles	Teaching styles applied in experimental group	Educational content for both groups, according to curriculum
Soccer unit			
19	3	Guided discovery, convergent and divergent	Receiving skills
20	3	Inclusion, convergent and divergent	Passing and shooting
21	3	Reciprocal, self-check and convergent	Heading
22	3	Inclusion, guided discovery and convergent	Goalkeeper
Track and field unit			
23	2	Inclusion and divergent	Throwing skills/shot put throw without momentum
24	4	Reciprocal, guided discovery convergent and divergent	Shot-put throw
25	2	Inclusion and divergent	Javelin throw without momentum
26	3	Reciprocal, self-check and convergent	Javelin throw
27	2	Reciprocal and convergent	Running skills
28	2	Inclusion and reciprocal	Skipping- running spread
29	2	Inclusion and reciprocal	Jumping vents-long jump
30	4	Inclusion, reciprocal, self-check and divergent	High jump
Fitness unit			
31	2	Self-check and guided discovery	Strength training
32	2	Inclusion and divergent	Strength training
33	2	Self-check and guided discovery	Flexibility training
34	2	Self-check and guided discovery	Stretching exercises
35	2	Reciprocal and divergent	Agility strength training
Gymnastics unit			
36	3	Inclusion, reciprocal and divergent	Rolling skills-forward and backward roll
37	2	Reciprocal and convergent	Handstand
38	3	Reciprocal, guided discovery and convergent	Cartwheel

in applying student-activated teaching styles and they received the professional development training (8 hours) that covered the structures and practical examples of the different teaching styles. The content of the two four-hour workshops included the following themes: (a) implementing activated teaching styles, (b) posing appropriate questions to guide students from basic knowledge to higher-order thinking, (c) using criteria cards, and (d) activating students' prior knowledge.

The fidelity of the intervention plan was checked through: (a) providing PE teachers with lesson plans designed by the researchers, and (b) the intervention group teachers kept a diary about the use of the lesson plans and they all implemented the same number of lesson plans ($N = 38$). Within these diaries, teachers wrote down each venue (including information such as inside the gym or outside) and the dates and exact times of each lesson. They also documented where assigned activities didn't take place due to time constraints.

Data Analyses

Firstly, a confirmatory factor analysis was run to test the construct validity of the instruments that were used. Secondly, to investigate the effectiveness of the intervention program, repeated measures MANOVAs were computed (measurement X group X gender), to examine the effects of the intervention plan using as independent variables: (a) the gender (boy or girl), and (b) the group (experimental or comparison). Metacognitive variables, motivational variables and lesson satisfaction were used as depended variables. For data analysis, SPSS 18.0 was used.

Results

All scales had acceptable internal consistency reliability ($\alpha > .68$) according to Moss et al. (1998) who suggested that Cronbach alpha values above 0.6 are acceptable. Partial eta squares indicated large effect sizes for procedural knowledge, and information management, small effects sizes for planning and identified regulation, and moderate effects for the remaining variables (Cohen, 1988). There were not any gender differences. Results from data analysis are presented in Table 3.

Discussion

The purpose of this study was to investigate the effectiveness of a combination of student-activated teaching styles (reciprocal, self-check, inclusion, guided discovery, convergent, divergent) in the development of student metacognitive and motivational processes in physical education classes. More specifically, the experimental group, compared with the comparison group, had significantly higher scores on metacognitive processes such as declarative knowledge, procedural knowledge, conditional knowledge, information management, planning, self-monitoring, debugging strategies, evaluation and mental imagery.

This can be probably attributed to the implementation of a variety of teaching styles. Intervention group students had the opportunity to enrich their declarative knowledge in different and alternative ways (e.g., under the support of the criteria cards or teacher's guidance). The combination of student-activated teaching styles

Table 3 Descriptive statistics of the two measurements (Scale = 1–5).

	Experimental group				*Comparison group*					
	Pretest		**Post- test**		**Pretest**		**Posttest**			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	η^2
Declarative knowledge	3.96	.63	4.20	.43	3.95	.61	4.02	.75	41.27*	.06
Procedural knowledge	3.71	.68	4,16	.42	3.8	.69	3.82	.72	124,10**	.17
Conditional knowledge	3.71	.85	4.02	.47	3.73	.87	3.59	.86	39.90**	.06
Information management	3.39	.80	3.94	.57	3.34	.85	3.41	.80	130,20**	.18
Planning	3.92	.89	4.16	.52	3.96	.85	3.80	.88	24,54**	.04
Self-monitoring	3.92	.77	4.25	.43	4.04	.72	3,83	.77	54,20**	.08
Debugging strategies	3.72	.83	4.08	.43	3.76	.85	3.60	.81	59,64**	.09
Evaluation	3.43	.90	3.77	.55	3.29	.92	3.33	.85	45,21**	.07
Mental imagery	3.34	1.1	3.85	.64	3.45	.99	3.35	.94	75,27**	.11
Intrinsic motivation	4.17	.73	4.40	.40	4.16	.72	4.14	.72	38,16**	.06
Identified regulation	4.13	.69	4.25	.52	4.21	.63	4.03	.74	9,00**	.02
Extrinsic motivation	3.03	.06	2.57	.05	2.93	.07	2.98	.06	50,83**	.08
Amotivation	2.48	1.0	2.23	.72	2.28	.93	2.55	1.05	18,99**	.03
Lesson satisfaction	4.05	.03	4.37	.03	4.24	.04	4.25	.03	68,25**	.10

Note: * = $p < .05$, ** = $p < .001$

may have encouraged students to learn about concepts, and strategies (declarative knowledge), related to executing the appropriate motor skill (procedural knowledge) and when to use it (conditional knowledge) to succeed in game situations.

The higher scores for the experimental group in procedural knowledge and information management (effect sizes .17, and .18 respectively) may be due to the discussion with educators and classmates where students learned how to organize information and use it. This process helped teachers to increase their repertoire of strategies (debugging strategies) to execute the right movement at the right time. The significant differences that were observed between the two groups in evaluation may be due to the observation and peer-evaluation or self-evaluation that was used in the student-activated teaching styles as students judged the performance of their peers and their own performance. Our findings are in accordance with the results of other studies that have pointed out that teaching styles such as self-check (Papaioannou, Theodosiou, Pashali, & Digelidis, 2012) or reciprocal can promote metacognitive activities (Iskala et al., 2004).

Our second hypothesis about the role of the student-activated teaching styles on motivational processes and specifically in motivation and lesson satisfaction was supported since our results indicated that the experimental group had higher scores in motivational processes including intrinsic motivation, identified regulation and lesson satisfaction (see Table 2). It is noteworthy that there were small effect sizes in identified regulation and amotivation (see Table 3). This outcome of smaller differences may be a result of the good intentions and perceived willingness of students at these ages to participate in physical activities.

In general, students from the intervention group had lower scores in extrinsic motivation and amotivation compared with the comparison group. Maybe the "autonomy-supportive" environment motivated students to participate in physical education activities because they intrinsically wanted to, and not because they were told they had to. Our findings support the notion that student-activated teaching styles create an environment that is more conducive to learning and has a positive effect on lesson satisfaction, task engagement and motivational orientation (Ntoumanis, 2001).

It was hypothesized that the teachers in the comparison group were using the typical teacher-centered teaching styles, according to recent researchers' findings where teachers were observed (Gorozidis & Papaioannou, 2011). This is a limitation of the study since the use of teaching styles by comparison group teachers was not monitored. The findings of this study give further support for the use of student-activated teaching styles. Therefore, educators have the responsibility to become familiar with all teaching styles, be flexible, and integrate various teaching styles to achieve the desired goals and encourage lifelong physical activity behaviors.

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