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CONTRIBUTIONS OF THE SPECTRUM OF TEACHING STYLES TO RESEARCH ON TEACHING

Key words: spectrum, teaching styles, review.

ABSTRACT

This article is a review of research on the Spectrum of Teaching Styles [53]. The Spectrum is a unified theory of teaching developed by Muska Mosston in the 1950s and 1960s. By means of electronic database search, 47 studies (doctoral dissertations, research projects, and research articles) have been identified since 1980. The studies are presented and discussed in two phases: (a) The Spectrum and research on teaching (studies completed between 1980 and 2008 are critically reviewed) and (b) closing remarks and suggestions for continuing and expanding Spectrum research. The results of the review are presented in the light of the Spectrum theory.

It has been stated that each scientific discipline should have a conceptual framework [30]. A conceptual framework can provide authors with definitions and parameters and can serve as a repository for gathering results. Additionally, it can help to identify areas of the discipline yet to be explored. A variety of frameworks have been developed in gymnasium and classroom environments [22, 45, 25, 51, 74]. These frameworks help to describe and organize the teaching process.

One of those conceptual frameworks is the *Spectrum of Teaching Styles*. The theory of the Spectrum was introduced by Muska Mosston in the first edition of his book, *Teaching Physical Education,* published in 1966. Over the years four editions of the book have been published and the Spectrum theory has been clarified, evolved, and expanded significantly.

The Spectrum consists of eleven landmark teaching styles. Each style has its own decision-making amalgamation and name that corresponds to a letter of the alphabet: the Command style (A), the Practice style (B), the Reciprocal style (C), the Self-Check style (D), the Inclusion style (E), the Guided Discovery style (F), the Convergent Discovery style (G), the Divergent Production style (H), the Individual Program (I), the Learner-Initiated style (J), and the Self-Teaching style (K).

The governing principle of Spectrum theory is that decisions are the unifying element that connects the teaching and learning experience. By identifying specific sets of decisions made by the teacher and the learner, significantly different learning conditions are produced. Conditions are either more or less profitable in terms of the learning objectives at hand. This theory is based on a non-versus approach to teaching, meaning that all teaching styles, when used appropriately, contribute to human development in different ways. No one teaching style is the only or the best universal teaching-learning approach [53].

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According to the Spectrum theory, the eleven styles can be clustered into either Reproduction (styles A-E) or Production (styles F-K) teaching styles. The Reproduction cluster is more akin to direct, didactic, or teacher-centered instruction [27, 28]. When styles A-E are used the purpose of the instruction is the replication of specific known skills and knowledge. The teacher specifies the subject matter of the lessons, indicates the learning conditions by identifying the teaching style, and defines the criteria for correct task completion. The class climate is one of performing the model, repeating the task, and reducing errors. Feedback is specific, often corrective, and there is an acceptable way to perform the selected task.

The Production cluster of styles F-K invites the discovery of new information by the student. In some styles within this cluster the production of ideas may even be new to the teacher. In styles F-K students are engaged in cognitive operations such as problem solving, inventing, comparing, contrasting, and synthesizing. The class climate favours patience and tolerance and individual cognitive and emotional differences. Feedback refers to the production of new ideas.

The focus of this paper was to review Spectrum research on teaching (SRT). SRT includes studies that focus on the effects of one or more teaching styles on learning outcomes. Spectrum research related to teacher education and to teachers' use of and experiences with teaching styles was not included in the review. The review was delimited in order to provide an in-depth analysis of SRT.

An exhaustive literature search utilizing the following electronic databases was conducted: ERIC, Sport Discus, Dissertation Abstracts International, ISI Web of Science, and Google. Specific keywords were used during the search process to be sure that all published data-based SRT were included in the review (e.g., *the Spectrum of Teaching Styles*). Dissertation abstracts and research studies published in books, journals, and conference proceedings were reviewed. In most cases journals were an outlet for the dissertations presented in this review. For example, certain researchers [12, 10, 65] submitted their dissertations for publication [11, 13, 14, 66]. The above research papers were the basis for the information in the review because, while dissertation research is valuable, the publication of research in a journal includes a peer review process and that suggests a less biased, professional investigation and presentation [71].

The review of SRT spans twenty-eight years: from 1980 to 2008. Although a review of Spectrum research has already been published [6] the present review includes: (a) more recent studies; (b) studies completed inside as well as outside North America, which provides an international perspective on SRT; and (c) new and expanded view for designing and conducting future SRT.

THE SPECTRUM AND RESEARCH ON TEACHING

In an attempt to determine what effective teaching is, researchers have employed the process-product research paradigm to investigate relationships between teacher behaviour and learner achievement or the efficacy of different teaching methods [70]. SRT was based on that process-product paradigm. More specifically, studies have been conducted to test the theoretical relationships between particular teaching styles and certain learning outcomes. The logic is that specific teaching styles, because of the specific teacher behavior they assign and specific learning outcomes they encourage, create conditions for learning that promote the particular learning outcome at hand. The first attempts to test those relationships were made in North America in the 1970s. This early SRT yielded mainly non-significant results because the studies suffered from methodological and theoretical deficiencies [see 6, 35, 30, 40, 47, 69, 70 for a discussion]. These studies will not be reviewed in this paper because this period of SRT has been well documented in the literature [see 6].

Therefore, the present review of SRT focuses on research carried out from 1980 onward. The reviewed studies are categorized according to the domain focus for student development: psychomotor domain, affective domain, cognitive domain, social domain, and moral domain. These domains are reflected in what Mosston called *The Developmental Channels* [53]. Some studies focus on more than one domain and, thus, they are discussed more than once. The reader is expected to have the basic knowledge of each teaching style to follow the review. Therefore, a description of the teaching styles is not included.

Psychomotor Domain

A plethora of Spectrum studies has dealt with the effects of disparate teaching styles on motor skill acquisition. When motor skill gains between pretest and posttest were examined, the results were consistent: All studies showed that teaching styles from the Reproduction cluster were effective in promoting motor skill acquisition over time. However, when comparing the effectiveness of these styles at the end of the teaching/training period (posttest), the results were mixed as the following will detail.

Nonsignificant results. Some Spectrum studies yielded non-significant results. In particular, seven studies employed fifth grade students and compared the effectiveness of (a) the Command and the Reciprocal styles on students' performance in archery [73]; (b) the Practice, Reciprocal, and the Inclusion styles in a hockey accuracy task [35, 36, 27]; (c) the Practice and the Reciprocal styles in a lacrosse accuracy task [32] or in two volleyball tasks (forearm pass and overhand serving) [49]; (d) and the Practice and the Inclusion styles in three physical fitness tests (sit up, shuttle run, and standing long jump test) [12].

No significant differences were found when the same teaching styles were implemented and different age groups and motor skills were employed [3, 44, 76]. In Beckett's study, college students received instruction in soccer-ball-juggling in either the Practice or the Inclusion style. In Wilson's study, third grade students received instruction in a throwing accuracy task with the Practice or the Reciprocal styles. In Johnson's study undergraduate students received instruction in tumbling skills with the Command or the Reciprocal styles.

Why there have been so many non-significant results? A possible reason is that the sample size of the above studies, which ranged from 46 to 136 students, was too small to detect significant differences. In addition, researchers did not have definitive behavioural descriptions of and scripts for the independent variable. In retrospect, it is clear that some of these investigators were not performing the style behaviour correctly (M. Goldberger, personal communication, January 8, 2008).

Significant and consistent results. Additional studies yielded significant and con-sistent results. The Command and the Practice styles were found to be more effective than the Reciprocal style in skill acquisition in college students as they performed rifle shooting [5]. Also, the Practice style was more effective than the Reciprocal style in basketball dribbling and jump shot [64]. Their results are consistent with another study which found that the Practice and the Inclusion styles were more effective than the Reciprocal style in skill acquisition in fifth grade students as they performed a hockey accuracy task [33]. The above study [64] supports the claim that the Practice style is most appropriate to teach the psychomotor skills of dribbling and shooting [53].

Similarly, it has been reported that college-aged students who receive instruction in badminton (short-low serves) with the Practice style performed better than their counterparts in the Self-Check style [1]. Also, the practice style was more effective in fostering skill changes in fifth graders as they performed football punting over a control group [34]. Likewise, no significant differences between the Reciprocal/Self-Check styles and a control group in basketball performance (chest-pass, dribbling, and jump shot) of high school students were found [48].

Significant and conflicting results. Other Spectrum studies yielded significant and conflicting results. For example, it was found that fourth and fifth grade students within the Inclusion style performed striking with a long-handled implement better than their counterparts in the Practice and Self-Check styles [43]. This finding is not congruent with the results of other studies [33, 1] which found that the Practice style is more effective than the inclusion or the Self-Check styles. Moreover, two studies [58, 1] reported results that did not support the findings of previously mentioned research [5, 35, 27, 33, 44, 73]. They found that the Reciprocal style was more effective in gymnastics skill acquisition of high school boys [58] and in handball shooting skills of university students than the Command or Inclusion styles [1].

Although insightful, all the above studies provided inconclusive results. This lack of confirmation makes it difficult to suggest conclusions. It seems that due to the lack of clear research results on various teaching styles, the effectiveness of the Spectrum is relatively unknown [19]. The inconclusive results have been attributed to the variety of motor skills and age groups as well as to the short duration of the interventions [3, 5, 39]. For the focus of this paper another three reasons were added: (a) lack of use of qualitative methods, (b) lack of accurate knowledge about the theory and

implementation of the Spectrum, and (c) exclusive focus on motor skill acquisition.

Qualitative methods help to answer questions related to the meaning of events to participants, teachers, and students. The use of qualitative methods sheds light on teaching and on what is going on in the gymnasium that may not be readily apparent [62]. It is recommended that to fully explain effective PE teaching, it is important to learn more about students' thoughts as they acquire motor skills [46]. The lack of qualitative methods concealed important evidence about teaching style effectiveness.

Furthermore, some of the researchers did not accurately or thoroughly understand the theoretical premises underlying the teaching styles under scrutiny. That was evident by the fact that they made inappropriate connections between styles and learning outcomes. For example, some Reciprocal style studies appeared to exhibit a lack of Spectrum knowledge. These Reciprocal style studies [1, 44, 49, 58, 73, 76] examined learning outcomes from the psychomotor domain. However, this style emphasizes learning outcomes from the social or the cognitive domains [53].

Lastly, some of the studies looked only at motor skill acquisition by asking the question: Which style will best improve motor skill performance? This comparison is invalid between or among styles on the Reproduction side of the Spectrum. All styles on the Reproduction side are designed to support achievements in the psycho-motor domain (subject matter objective) [53]. Differences will not be significant when only one general variable is used that is common to all styles. According to the Spectrum theory all reproduction styles can achieve motor skill attainment but each style emphasizes different behaviour attributes/objectives, e.g., self-assessment and feedback, beginning of independence, examining the self-perception [53]. It is the decisions and therefore the behaviour attributes/objectives which are highlighted that make all the styles different from one another. It is thus inappropriate for any researcher to ask: Which style will best improve motor skill performance?

Reproduction cluster vs. Production cluster. All the aforementioned studies were comparisons between different teaching styles included in the Reproduction cluster. Five studies examined teaching styles from the Reproduction cluster against teaching styles from the Production cluster.

In three studies the results were not significant. The Guided Discovery style was found to be as effective as the Command style in promoting skill gains in college students as they performed volleyball tasks (bump and serve) [56] and in elementary school students as they performed fundamental skills [21] or a novel golf task [66]. The other two studies reported significant results. The first study [42] examined the effects of the Command and Guided Discovery styles on the performance of the cartwheel by fifth-grade students. The results revealed that the Guided Discovery style was more effective than the Command style. The second study [72] reported that the Practice style was more effective than the Convergent Discovery style in badminton performance (overhand clear, drop shot, smash) of high school girls.

Why are these results inconsistent? Theoretically, the Guided Discovery and Convergent Discovery styles primarily emphasize the cognitive domain [26, 53]. Therefore, it seems that examining these styles for motor skill acquisition, which relies on teaching styles from the Reproduction cluster, is incongruent with the Spectrum theory and leads to invalid and misleading conclusions. It was stated [52, p. 254] that "Examining styles from one cluster against learning outcomes that belong to the other cluster will yield inappropriate and inaccurate results".

Further, in these studies the subject matters and the style selection were incompatible. Volleyball (bump and serve) or gymnastics (cartwheel) are physically challenging and perhaps not conducive to be taught to novice performers using the Command style. According to the Spectrum theory the Command style is appropriate for teaching activities which require synchronization, precision, and a high degree of uniformity (e.g., dance, aerobics, karate, synchronized swimming) [53]. Matching the content with the style is critical for conducting valid research [53].

Affective Domain

Spectrum research has also focused on the affective domain. The self (perceived competence, self-efficacy), attitudes towards physical activity, perceptions of teaching styles, and motivational climate/goal orientation are but a few learning outcomes which have been the focus of SRT.

The self

In one study fifth-grade students reported higher perceived athletic competence when taught in the Inclusion style as compared with the Practice style [13]. In another study, no significant differences were found in fifth graders' perceived athletic competence between the Practice and the Inclusion styles [14]. However, when gender was factored into the analysis, girls of the Inclusion style had higher perceptions of athletic competence than girls of the Practice style and the control group, whereas boys profited most from the Practice and the Inclusion styles than the control group.

Another study yielded similar results [38]. The motivational effects of the Practice and the Inclusion styles in track and field were examined. Results indicated that 12-13 year-old girls in the Inclusion style group had higher perceptions of competence in track and field athletics than their counterparts in the Practice style group.

When using the Inclusion style, teachers provide different levels of difficulty within each task by making intra-skill and equipment modifycations. By designing activities in this manner the teacher provides students with optimal degrees of inclusion, continued participation, and challenge. These opportunities often lead to a bigger success in task completion [53]. The aforementioned studies provide evidence to support the claim that in the Inclusion style success in performance is more frequent and, thus, the feeling about oneself is more positive [53].

No significant results were reported when self-efficacy was employed as a variable. The effects of the Command and the Practice styles on self-efficacy of university students have been studied [41]. Self-efficacy increased for all students with no significant difference in style. Similar results were found in another study of self-efficacy [66]. The elementary students in that study [66] showed no difference in self-efficacy when taught within the Command and the Guided Discovery styles. It seems that the short duration of these studies (a 20-minute lesson in Salter and Graham and 19 days in Harrison et al.) did not allow significant differences to be detected. It is stated [52, p. 27] that "Any behaviour study must last long enough for the new behaviour to manifest itself". Therefore, upon additional scrutiny, the above two studies represent questionable research for reasons mentioned in the previous section.

Attitudes towards physical activity

Research on students' attitudes has been the focus of many researchers [68]. Given that teacher behaviour is one of the variables that influences student attitude [39], Spectrum researchers investigated the impact of teaching styles on students' attitudes towards physical activity or PE.

In two studies high school students (7th or 10th graders) participated in a yearlong intervention programme [15, 23]. Students who received instruction with the Reciprocal and the Inclusion styles had more positive attitudes towards exercise and participating in sports than their counterparts in a control group. Similarly, high school students who received instruction with the Inclusion style displayed more positive attitudes towards exercise than their counterparts in the Command and the Reciprocal styles or in a control group [58].

Additionally, the reciprocal style had a greater influence on college students' attitudes towards exercise than the Practice style [64]. Moreover, fifth and sixth graders who were taught tennis with the Self- check style, had more positive attitudes towards tennis and PE than their counterparts in the Command style or in a control group [60]. In only one study college students in Command style classes were more favourable towards volleyball tasks [41].

It can be argued that the new awareness of deliberately delivering decisions as a part of the role expectation may influence students' dispositions about physical exercise. For example, in the Reciprocal style students are told that their role is to compare the doer' performance against the provided criteria and to give and receive feedback from their partner (peer). This deliberate relationship develops socialization skills. The Self-check style shifts the criteria checklist for performance assessment to the individual. This deliberate relationship develops performance tenacity and honesty. The Inclusion styles shifts selecting the level of performance difficulty to the individual learner [53]. Moreover, two additional studies revealed that student motivation, which is believed to foster positive attitudes, appears to be engendered in the Reciprocal style [7] and in the Inclusion style of teaching [38]. Given that positive attitudes towards exercise is often associated with an active lifestyle [23], it is reasonable to use these styles to teach PE.

Perceptions of teaching styles

A different line of research has looked at students' attitudes towards or perceptions of teaching styles. Such research is important because it can serve certain purposes. It can inform teachers about factors that motivate students to learn [7] and help teachers meet students' initial preferred learning styles or understand negative responses to a new style [19].

A group of studies showed that students' preferences for teaching styles were influenced by the subject matter or sex. It was found that college students preferred the Command style to be used in the karate class and the Inclusion style was preferred in the racquetball class [11]. This finding supports the idea that participants in karate activities are willing to accept Command style behaviours [53]. On the contrary, it was reported that university students disliked the way a riflery class was taught with the Command style [5]. Further, college students in fitness courses perceived greater benefit for the Self-check and the Divergent Production styles [19]. Moreover, elementary school children enjoyed more the Guided Discovery style than the Command style when taught gymnastics [61]. In addition, female students reported higher ratings for the Inclusion, Divergent Production, and the Individual Program-Learner's Design styles [19].

Other studies showed that fifth grade students in the Reciprocal style reported being empowered, challenged and fully engaged within a positive and enjoyable learning environment [7]. Also, elementary and junior high school students were most comfortable giving and receiving feedback (Reciprocal style) from partners who are friends [9, 24]. In addition, fourth and fifth grade students felt free, comfortable, relaxed, successful, powerful, good, and active during instruction with the Practice, Self-check, and Inclusion styles [43].

Motivational climate/goal orientation

Until recently, the effects of teaching styles on students' motivation have not been researched. Within the last 10 years six studies that dealt with that issue have been located. The researchers used achievement goal theory. According to that theory, two goals predominate in achievement settings like PE: task and ego. When a task goal is set, children utilize an undifferentiated conception of ability; that is ability is construed as effort and levels of ability are self-referenced and dependent upon improvement and learning. In contrast, when an ego goal is set children use a differentiated conception of ability, where ability is perceived as capacity and is demonstrated when outperforming others. The perception of a high task-involving climate is positively related to students' intrinsic motivation in PE.

The Inclusion style of teaching was associated with higher levels of 12-13 year old female students' task orientation and intrinsic motivation than the Practice style was [38]. Similarly, the Self-check and the Inclusion styles were equally effective in increasing sixth grade students' task involvement and intrinsic motivation and more effective than the Practice style [59]. Further, the Reciprocal and the Guided Discovery styles resulted in a more task-involving teaching climate in comparison to the Command/Practice style [50]. When the Reciprocal and the Self-check styles were compared, the results showed that a Self-check style group of high school students had higher scores of intrinsic motivation than a Reciprocal style group [48].

The inclusion and the Reciprocal styles did not have any effect on high school students' goal orientation (either task or ego) and intrinsic motivation [15]. The authors attributed this lack of influence to a long teacher strike, which led to several weeks of lost lessons, large-scale violence, and police repression. This may have caused student disturbance during the academic year [15]. In contrast, high school students who received instruction with the Reciprocal style had higher scores in task orientation and lower scores in ego orientation than the control group [23].

It seems that by having students involved in the decision making process to a greater extent, or by emphasizing cognitive or personal development (as is the case in the Inclusion and Self-check styles), intrinsic motivation and task involving climate are enhanced. Based on the above findings, PE teachers should employ these teaching styles to create a positive motivational climate.

Cognitive Domain

Certain aspects of the cognitive domain have also been investigated; namely, knowledge of the subject matter, ability to analyze motor skills, ability to make decisions, and divergent production of movement design.

Knowledge of the subject matter

Many studies have looked at the impact of various teaching styles on learner knowledge of subject matter. Under the conditions of the Command, Practice, Reciprocal, Self-check, Inclusion, and Guided Discovery styles elementary or high school students achieved gains between pretest and posttest in knowledge on archery [73], golf (striking) [66], gymnastics (principles of biomechanics) [58], juggling [24, 43], or fundamental manipulative skills [21].

Fifth grade students taught with the Command style did not score higher than their counterparts taught with the Reciprocal style on a written knowledge test on archery [73]. It should be noted that the students in the Reciprocal style should have done better than the Command style students. In the Reciprocal style students take the subject matter individually and receive from their peers immediate and frequent feedback about performance [53]. This serves as a mental practice that supports cognitive development [53].

Contrary to Virgilio's study [73], college students taught with the Inclusion style gave more correct answers on a written knowledge test on soccer-juggling than their counterparts taught with the Practice style [3]. Another study [43] supported the findings of Beckett's study. It was found that elementary school children who received instruction with the Self-check and Inclusion styles reported greater number of specific skill elements (knowledge test) than students in the practice style. Moreover, the instruction presented within the framework of the Reciprocal style can have positive effects on elementary school children's knowledge of juggling compared to a control group (no instruction) [24].

The above findings support two contentions [53]: (a) When learners have to make decisions about selecting an entry point for task practice (Inclusion style), they may engage in more extended cognitive involvement; and (b) by comparing and contrasting their partners' performance (Reciprocal style) or their own performance (Self-check and Inclusion styles) against criteria, learners engage in more extended cognitive involvement.

However, when teaching styles from both clusters were employed the results were non-significant or conflicting. Two studies revealed that there were no differences in knowledge gains between the Command and the Guided Discovery styles in elementary school children [66, 21]. On the contrary, high school female students who received instruction in badminton with the Practice style scored higher on a written knowledge test than females in the Guided Discovery style [72]. All three studies employed knowledge tests which require that students recall past knowledge of subject matter. It is rather futile and contrary to Spectrum theory to examine the effects of the Guided Discovery style on learners' basic cognitive operations (such as recall or memory). The Guided Discovery style engages learners in cognitive operations other than memory and recall [53]. In addition, in one study systematic observation to verify teaching style implementation was not used [21]. This is a serious drawback that raises questions about the accuracy of the results.

Ability to analyze motor skills

The ability to analyze motor tasks was investigated in two studies [32, 76]. In both of them elementary school children participated in the Practice style and the Reciprocal style groups. The Reciprocal group significantly outperformed their counterparts in their ability to detect errors and analyze movement related to the lacrosse throw [32]. The Reciprocal style engages the learner in assessing his/her partner's performance following a teacher prepared criteria [53]. Thus, it makes sense that the learner will be able to analyze movement with more accuracy when taught in this style. However, the second study [76] did not support the results of the first [32]: No differences between the two groups in the ability of the students to analyze the overhand throw were found. Perhaps the small sample size (N=79) or the lack of teacher-made criteria did not allow significant differences to be detected.

Ability to make decisions

Mixed results about students' ability to make decisions in the Inclusion style were reported [8, 36]. When fifth graders received instruction in striking with a bat for two 30-minute lesson they: (a) selected different levels of task difficulty when provided the opportunity; and (b) made task decisions based on perceived success and challenge [8]. These findings support the idea that in the Inclusion style learners will engage in an activity at a skill level that matches their abilities [53].

In contrast, elementary school students made inappropriate level of difficulty decisions [36]. In

particular, boys significantly overestimated their ability when making their initial level decision, most often selecting the most difficult level. It seems that "self concept and peer pressure are factors in this phenomenon" [30, p. 44]. Furthermore, very young children do not have enough experience in the task to adequately make level decisions when taught with the Inclusion style [53].

Divergent production of movement design

Four studies examined the effects of the Divergent Discovery style on elementary school children's divergent movement ability. The first two studies employed second and third grade students and fifth grade students, respectively [16, 18]. They randomly assigned students to the Divergent Production style, the Command/Practice style, and a control group [16] or to Convergent Discovery/Divergent Discovery styles [18]. In the third pilot study fourth, fifth, and seventh grade students were randomly assigned either to a Divergent Production style group or to a Practice style group [37]. The fourth study employed third grade students who were assigned to either a Divergent Production style group or to a control group [4].

All four studies reported that elementary school children were more capable of producing divergent movement patterns when they received instruction with the Divergent Discovery style than their counterparts in the practice style or in a combination of the Command and Practice styles. Their findings support the notion that learners are in a position to produce divergent ideas when presented with problems that require multiple responses [53].

Social Domain

In three studies, the effects of the reciprocal style on social skills of fifth grade students related to giving and receiving feedback from a peer were examined. These studies found, using behavioural analysis tools, that under the conditions of the Reciprocal style students demonstrated more empathy, praise, and encouragement when compared with their control group counterparts [35, 32]. Also, the Reciprocal style students used more effective content feedback more often and requested content feedback from their partners more often [36, 32]. However, when the above social skills were observed one week after the end of training, it was revealed that the effects of the Reciprocal style were not long-lasting [36].

Certain behaviours of elementary school gymnasts by means of comparing the Command, the Practice, and the Reciprocal styles in gymnastics instruction were investigated [20]. It was found that the Reciprocal style had a definite advantage over the Command and the Practice styles in the number and nature of given feedback. In particular, the number of social exchanges was greater and more positive in the Reciprocal style of teaching. Also, antisocial behaviour was nearly nonexistent in the Reciprocal style compared to the Command and Practice styles. In the Reciprocal style, sample feedback statements are provided for the observers to guide their feedback. Internalizing this informative feedback approach and transferring it to other situations takes repeated practice and a continued awareness to the effects of feedback on the emotions and cognition of others [53].

Another study [9] looked at the effects of two different learner-pairing techniques in the Reciprocal style on the frequency of the observer feedback. When elementary school children were paired by companionship (friend and no acquaintance), the observers gave specific feedback more frequently to friends than non-acquaintances. When paired by ability level (high, low, and mixed), they reported no effect on the amount of specific feedback provided by the observer.

The Reciprocal style of teaching emphasizes the social domain and promotes social interactions between students [7, 17, 26]. Not only does data based research support this statement but also empirical evidence supports several hypotheses underlying Mosston and Ashworth's theory [53]. Three examples include (a) proper verbal behaviour involved with giving and receiving feedback and empathy are enhanced when the Reciprocal style is introduced to learners; (b) the most appropriate technique to encourage the communication between the doer and the observer is self-selection (to initially shift selection of partners to the learners); and (c) effective feedback (specific and corrective) is provided at a much higher rate in the Reciprocal style of teaching.

It should be noted that learner selection is initially important while students are learning the new behaviours this style has to offer. Generally, students will select the same partner to work with; however, this practice hinders development of the style's overall objectives. If the objectives of

expanded socialization and comfort working with others are to develop, it is important that learners choose a different "friend" or partner to work with in each reciprocal experience. Rotating and working with all students over a period of time is essential for developing social objectives such as patience and tolerance [53].

Although the Spectrum theory is supported by research studies, no significant gains in certain aspects of social development when high school boys engaged in the Command, Reciprocal, and Inclusion styles have been found [58]. Although the Command and Inclusion styles do not particularly emphasize social development [53], it is surprising that in this study the Reciprocal style did not have any impact on the social domain. This finding does not support the results of the previous studies. It seems that the different age group (high school boys vs. elementary school children), different outcome measured (social status and group cohesion vs. social interactions) as well as the nature of the outcome measure (paper and pencil instrument vs. observations via video recordings) may explain the conflicting results.

Moral Domain

Using Kohlberg's structural-developmental theory on morality, a study examined the effects of the Reciprocal style on moral reasoning of high school students using content from volleyball, track and field, and dance [54]. Using the Moral Judgment Test they found that the reciprocal style group had better scores on moral reasoning/judgments than a control group. The authors concluded that the Reciprocal style provides conditions (social/peer interaction, participation, mutuality, structured communication for the purpose of helping others) that encourage, according to Kohlberg's theory, the promotion of moral judgments.

CLOSING REMARKS

The field of SRT has increasingly expanded since the 1980s. SRT has addressed more diverse and varied questions concerning multiple human dimensions and domains of learner's development than in previous decades. Additionally, teaching styles have been examined with learners of different age groups and abilities. Furthermore, researchers have begun to cross the discovery

threshold and investigate teaching styles from the Production cluster. Despite the considerable number of publications on SRT, research on the effects and influence of the Spectrum to teaching and learning is far from being exhausted. Interesting suggestions for conducting future Spectrum research have already been made [6]. Nevertheless, there are issues, related to expanding such research, which have not been addressed so far.

First, there is valuable SRT that has been conducted that needs to be available and retrievable. Although many Spectrum colleagues in Finland, Portugal, Brazil, Czech Republic, and Australia have conducted Spectrum research, it was not possible to retrieve evidence of this SRT on any commonly searched database. Therefore, researchers should be encouraged to publish their work in renowned journals such as the *European Physical Education Review*, the *Physical Education and Sport Pedagogy* or the *Studies in Physical Culture and Tourism* and on the official Spectrum web site *(http://www.spectrumofteachingstyles.org)*. In this way, their work becomes more retrievable and serves the research community by offering a more complete picture and international picture of the research endeavours in the field.

Second, the Spectrum researchers should be concerned about the extent to which their study establishes that the teaching styles in use have actually caused the effect that is found (internal validity). An equivalent control group design is considered a very valid scientific approach to the investigation of research problems and its big advantage is the tight control it exercises on the threats to the internal validity [63].

Akin to the internal validity issue, is the need to employ systematic observation during the study. A major drawback of studies, which do not use some kind of systematic observation, is that the treatment is not verified [69]. Thus, there is no way of knowing whether or not it was implemented accurately. In other words, these studies suffer from a weak treatment effect, which biases the results of the research [71]. The employment of systematic observation necessitates the development of valid and reliable observation tools that comply with Spectrum theory. Without this development, SRT will be idiosyncratic and unreliable.

Third, attention needs to be given to reducing deficiencies observed in some studies: (a) non-compliance to the Spectrum theory (ignoring the decision patterns, comparing the landmark

objectives of one style against a different style); (b) inappropriate style comparison (i.e., Reproduction styles against Production styles); (c) inappropriate subject matter selection (e.g., teaching dribbling in basketball with the command style); and (d) short duration of the fieldwork.

Fourth, there is a need for a new approach to SRT. This approach (called episodic teaching) would investigate the outcomes and contributions of using a series of different teaching styles for a given period of time to teach content rather than just focus on one style as it is compared to another. An episode, in Spectrum terms, is defined as a period of time in which teacher and learner are engaged in a particular teaching style to meet a particular learning objective. In a typical school lesson most Spectrum teachers employ several episodes to meet the several objectives associated with the lesson. This is a much more natural way of observing the effects of specific teaching styles on specific learning outcomes.

This new approach is more compatible with the non-versus premise of the Spectrum. All styles are valid pending the objectives of the experience and each contributes to the overall educational process. Using alternative teaching styles in a deliberate sequence can produce expanded learning experiences that provide learning opportunities on multiple domains (psychomotor, affective, cognitive, social, and moral). It is time to expand Spectrum research beyond one style pitted against another. To date the majority of SRT has focused on one style against another; thus violating the non-versus reality of the Spectrum theory.

Fifth, there are always two sets of objectives to be reached in any teacher-learner interaction [53]: subject matter objectives, e.g., dribbling the basketball, and behaviour objectives, e.g., cooperation, self-assessment, honesty, replication, designing. These behaviour objectives are embedded within and result from the learning behaviour associated with each teaching style. The overwhelming majority of the reviewed SRT has focused on subject matter objectives. Researchers should look at the effects and influence of disparate teaching styles on behaviour objectives as well. Stated differently, SRT that begins to show the human/behaviour contributions of using teaching styles should be conducted. An example of such research can be found elsewhere [9, 8, 7].

The Spectrum is still a theory that offers valuable contributions to PE teaching. It provides a concrete model both for the systematic generation of research questions and as an organized repository for research results. If the present paper motivates future researchers to be interested in SRT, then one important goal will have been achieved.

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