



Effect of a Teacher-Focused Intervention on Teacher Self-Efficacy and Students' Motivational Climate: A Pilot Study in Physical Education

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The aim of this pilot study was to explore the effect of a 6-month teacher video-based reflection program on their students perceived motivational climate (MC) in physical education classes, and to examine potential improvements in teachers' self-efficacy (TSE) and how they link to MC. A pre-post-test design was used to assess the variables at three time points: before and after the intervention, and six months later. A total of 155 students from one elementary school and their teachers filled questionnaires on MC and TSE, respectively. MC did not change at post-test ($p = .282$). However, after 6 months, it showed significant improvements in all dimensions ($p < .001$). Average scores of TSE increased at post-test. Our findings support the use of video-based reflections for increasing teachers' responsiveness to diverse in-class situations, leading to a more positive students' perception of the in-class climate. More studies are recommended to better examine the interaction between these variables.

Keywords: professional training, reflection, self-efficacy, classroom environment, video technology

INTRODUCTION

Motivation is considered a central factor for students' success and involvement in the classroom. This is particularly evident in physical education (PE), as higher motivation is associated with higher engagement and learning (Mayorga-Vega et al., 2020), increased enjoyment of classes (Jaakkola et al., 2017), as well as increased participation in additional sporting activities that may result in adopting a healthier lifestyle (Fernandez-Prieto, Gine-Garriga, and Velez 2019). To achieve that, researchers and practitioners suggest creating a stimulating social-psychological environment, i.e., a positive motivational climate (MC) (Gil-Arias et al., 2020). Two of the major

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pedagogical theories supporting MC in PE are the Self-Determination Theory (SDT) and the Achievement Goal Theory (AGT) (Jaakkola et al., 2017). On the one hand, literature based on SDT suggests that the level of students' self-determined motivation is strongly associated with the satisfaction of the basic psychological needs of autonomy, competence, and relatedness (Wild & Neef, 2019). On the other hand, AGT connects the constructs of goal orientation and MC (Ames, 1992). The former is further divided into ego-involving climate, focused on performance, and strongly associated with decreased motivation (García-González et al., 2019), and task-involving climate, focused on self-growth and linked to higher internal motivation (Harwood et al., 2015).

PE teachers have a main role in the interplay of both theories, as their pedagogical strategies significantly influence students' perceived goal orientation (Hastie et al., 2014), satisfaction (Bassi, 2019), attitude towards PE (Illker & Asci, 2019), as well as PA behaviours (Németh et al., 2024). Along with their interpersonal skills, such as, their empathy in the classroom or the leadership style they assume (Allami et al., 2022), their professional competence (i.e., pedagogical and content knowledge, teaching strategies, management, instructions, etc.) is central to building up and maintaining positive MC (Kunter et al., 2013). Scholars generally agree that the ability to reflect upon one's own practice is an essential skill of any effective teacher (Tsangaridou & Polemitou, 2015). A solid ground of literature supports the assumption that teachers' ability to reflect on and learn from their own teaching events may improve their methodological culture and their willingness to look for diverse teaching strategies and techniques (DiGregorio & Liston, 2020; Kovaleva et al., 2019). Teachers' reflection may become even more important in PE, since more events take place simultaneously and the number of unexpected or unwanted situations involving a myriad of interactive sequences between students, teachers, and material, is remarkably larger than in any other subject (Barker & Annerstedt, 2016). Hence, teachers' reflection over their past lessons may help them respond better and faster in front of future in-class events, potentially leading to a better in-class climate for all participants. In this context, scholars have proposed teachers' self-efficacy (TSE) as a psychological variable that may also be affected by teachers' reflection on their in-class performance. Tschannen-Moran, Woolfolk, and Wayne (1998) describe TSE as an experience-based belief teachers hold about their competence to successfully perform teaching tasks through a variety of actions. TSE has been proven as one of the most important teachers' characteristics predicting students' learning outcomes (Sum et al., 2018). A higher TSE helps teachers identify the kinds of changes necessary to serve their students' individual learning needs better, which helps them attend classroom situations in a more efficient way (Johannes & Seidel, 2012). The direct positive association between TSE and MC has been demonstrated in previous research (Zee & Koomen, 2019). Research has also found positive relations between higher TSE and stronger professional commitment, openness to educational reforms, and implementation of novel teaching strategies (Chesnut & Burley, 2015). In addition, TSE seems to act as a facilitator of students' emotional, behavioural, and motivational engagement in the classroom (Zee & Koomen, 2019).

One of the factors that may have a role in the development of teachers' self-perception of efficiency and, ultimately, their in-class performance and their students' motivation, is teachers' professional vision (TPV) (van Es & Sherin, 2010). Hence, it has been used

as a key frame for designing and developing effective professional development programs worldwide (Lefstein & Snell, 2011). Sherin and van Es (2005) describe TPV as teachers' cognitive ability to notice and interpret key teaching-learning moments. Interpreting those essential processes that either foster or constrain students' learning, as well as carrying out corresponding actions to support their growth, is cornerstone to teachers' professional competence and to constantly improving teaching (Sherin, 2007). A solid ground of literature supports the hypothesis that enhanced TPV has a positive impact on both students' outcomes (Roth et al., 2011) and the quality of instructions (van Es & Sherin, 2010).

For the above, it seems evident that TPV programs may directly and indirectly (via changes in TSE) have an impact on students' MC. Therefore, the main objectives of our study were to assess the effect of a 6-month TPV intervention program on students' MC in a PE setting; to track changes in MC and TSE six months after the end of the intervention; and to explore the relationship between students' MC and teachers' self-efficacy before, at the end, and six months after the implementation of the TPV program.

METHOD

Design

A pre-experimental, one-group pre-post-test design was employed to assess the changes in the dependent variables after the intervention, and six months later.

Sample

Our sample was composed by 155 children attending fourth and fifth grade of an elementary school from General Escobedo, Mexico. Their two PE teachers (PET1, PET2) were included in the study and received the intervention program. Due to limited accessibility to school districts, our sampling technique was based on convenience and no further recruitment of teachers-students was possible. The study was approved by the Secretariat of Public Education of Mexico and received the governmental ethical approval. Additionally, teachers and parents/legal guardians of the students involved in the study signed an informed consent before the start of the intervention. Detailed sample distribution is provided in Table 1 below.

Table 1
Characteristics of the students participating in the study

Teacher	Grade	Age		Total
		Boys	Girls	
PET1	4 th	n = 8 9.25 ± .46	n = 15 9.40 ± .63	n = 23 9.35 ± .57
	5 th	n = 23 10.78 ± .79	n = 26 10.69 ± .74	n = 49 10.73 ± .76
PET2	4 th	n = 12 9.25 ± .62	n = 14 9.29 ± .47	n = 26 9.27 ± .53
	5 th	n = 23 10.52 ± .66	n = 34 10.88 ± .77	n = 57 10.74 ± .74
Total		n = 155 10.28 ± .96		

Note. PET1 = Physical Education Teacher 1; PET2 = Physical Education Teacher 2

Instruments

Motivational Climate in Physical Education Scale (Soini et al., 2014)

MC was measured by using the Language version of the MCPES, the validity ($\chi^2/df = 3.309$, AGFI = .953, NFI = .938, TLI = .911, CFI = .910, and RMSEA = .048) and reliability (Cronbach's alpha > 0.77 ; McDonald's omega < 0.79 for all four dimensions) of which was confirmed in our sample. The scale consists of 18 items (Likert scale from 1 = strongly disagree; to 5 = strongly agree), divided into four dimensions: Autonomy Climate (ACI), e.g., "Students are given opportunities to select activities according to their interests"; Task-Involving Climate (TICl), e.g., "It is important for the students to try their best during PE lessons"; Ego-Involving Climate (EICl), e.g., "It is important for the students to show that they are better in PE than others"; and Social Relatedness Climate (SRCl), e.g., "During PE lessons the students pull together".

Alternative Teachers' Sense of Efficacy Scale (Cocca & Cocca, 2021; Tschannen-Moran & Woolfolk Hoy, 2001)

TSE was measured with the alternative version of the Teachers' Sense of Efficacy Scale (A-TSES), composed of 21 items (Likert scale from 1 = 'Nothing' to 9 = 'A Great Deal') distributed into four domains. The A-TSES model showed reliable indexes of goodness of fit ($\chi^2 = 716.695$; $df = 171$; $\chi^2/df = 4.191$, AGFI = .921, NFI = .924, TLI = .927, CFI = .941, and RMSEA = .064), as well as good reliability for each of the four dimensions (Cronbach's alpha > 0.84 ; McDonald's omega < 0.80 for all four dimensions). The four major domains of A-TSES are "Efficacy of Instructional Strategies" (EIS), "Efficacy in Classroom Management" (ECM), "Efficacy for Student Engagement" (ESE), and "Efficacy in Students Misbehaviour" (ESM).

Procedure

The focal point of the procedure was the implementation of a TPV intervention based on video recordings of PE classes, which were then analysed and discussed by teachers and PE and pedagogy experts. The team of experts was composed by four specialists with a doctorate in Physical Education Pedagogy (two) and in Education (two), with at least ten years of experience in academic/professional practice. This TPV approach, known as video-based reflection (VBR), has been recently used in teachers' development (Korkko, Rios, & Kyyro-Ammala 2019; Yuan, Mak, & Yang 2020), and it promotes teachers' retroactive reflection on previous lessons, with the possibility for them to rewind and review situations several times using the recordings of their classes. To date, only a few studies have used VBR in PE settings (Lonsdale et al. 2016; Reuker 2017a; Reuker 2017b).

The study was carried out at the facilities of an elementary school from General Escobedo (Mexico) during a six-month period. The principal allowed both participants to take 90 min/month off their regular working hours for them to take part in monthly meetings with the research team. Also, these meetings counted towards their professional development training, which is yearly required by the Secretariat of Public Education of Mexico.

The intervention protocol, based on multi-step cycles (Weber et al., 2018) repeated every month during the implementation of the program, started with the video recording of two lessons from both PE teachers, usually lasting between 35-50 min each. These recordings were then used for individual and group reflections as follows:

- a) *Teachers' video-based written self-reflection*: this self-reported method (Richards & Farrell, 2005) requires participating teachers to write their own reflection while observing their practices from their recorded lectures. In our study, teachers were provided with reflection guidelines based on a framework proposed by Kleinknecht & Schneider (2013), through which they reported their thoughts regarding any classroom events they detected in the videos (Richards & Farrell, 2005). Every month, these written reflections were to be delivered to the research team within a week after receiving the recordings.
- b) *Stimulated Recall Interviews (SRI)*: This technique is known in research within educational settings (Bicer & Bicer, 2023; Uibu et al., 2023; Yüksel et al., 2021), and it has already been used along with video recordings of teachers' lectures (Dempsey, 2010; Lyle, 2003). With this method, teachers are shown their own recorded lectures in a shared environment with experts and other participating teachers, and they are encouraged to talk about the events they are watching. All attendees in these meetings view and discuss together on the videos, with the guidance of the team of experts.
- c) *Experts' feedback*: the team of experts met with the teachers again in the final third of each month, shared ideas and provided them with feedback and concrete suggestions on how to attempt to solve issues that were highlighted in the previous steps or to make improvements in areas that were considered lacking based on their self-reflection and the SRI meetings.

Data from MCPES and A-TSES were gathered before the start of the intervention program, at its end, and six months after its conclusion, at the school facilities, by means of physical copies of the questionnaires. PE teachers were not present during the MC data collection to avoid any external influence in students' answers. At least one of the researchers attended the measurement sessions to respond to any questions or doubts during the filling in of the tools.

Statistical analysis

Data analysis was conducted using SPSS Statistics version 24 (IBM, Armonk, NY, USA). One-way repeated measures ANOVA with Greenhouse-Geisser correction was employed to establish changes in MC before, after the intervention, and at the follow-up. To evaluate changes in TSE, dimension mean scores were calculated based on the guidelines from the TSES questionnaire. Considering that it was not possible to recruit more than two teachers, we treated the results as in case-studies and we explored changes in TSE only in terms of rough average scores and their visual inspection from each different dimension at the three time points.

FINDINGS

Students' perceived motivational climate

The repeated-measure ANOVA with Greenhouse-Geisser correction determined that all dimensions of students' MC differed significantly between time points. The variables ACI ($F_{(1.842, 171.323)} = 7.148$; $p = .001$), SRCI ($F_{(1.666, 154.899)} = 16.530$; $p < .001$), and TICl ($F_{(1.905, 177.124)} = 3.136$; $p = .048$) showed similar patterns: no significant differences were found at post-test, but all follow-up scores were significantly higher than both pre and post-test ($p = .001 - .048$). Regarding EICI ($F_{(1.891, 175.873)} = 16.738$, $p < .001$), no differences were found at post-test, whilst follow-up scores were significantly lower than the pre- and post-test ones ($p < .001$). Figure 1 shows the changes in each of the dimensions of MCPES over the period of intervention and at the follow-up.

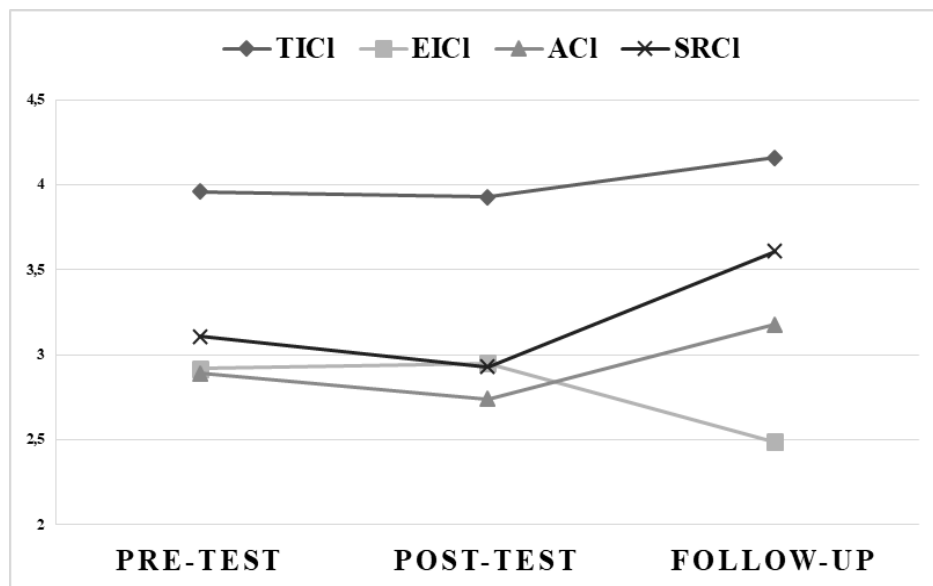


Figure 1

Changes in the dimensions of motivational climate before and after the intervention, and at the follow-up

Note. TICl = Task-involving climate; EICI = Ego-involving climate; ACI = Autonomy climate; SRCI = Social relatedness climate

Teachers' self-efficacy

Initial TSE was around or above the average score for both teachers. Both teachers obtained the lowest scores for ESM (PET1 = 5.75; PET2 = 6.25), whereas the highest scores were found in ESE (6.75) for PET1, and in EIS (6.88) for PET2. Analysis of the raw data showed an increase in all categories for both teachers. At post-test, all scores were above average or near the maximum possible score. At the follow-up, all scores were lower than at the post-test for both teachers; however, follow-up results were still

higher than those found before the implementation of the intervention program. A summary of the results from the TSES questionnaire applied to both teachers is shown in figure 2.

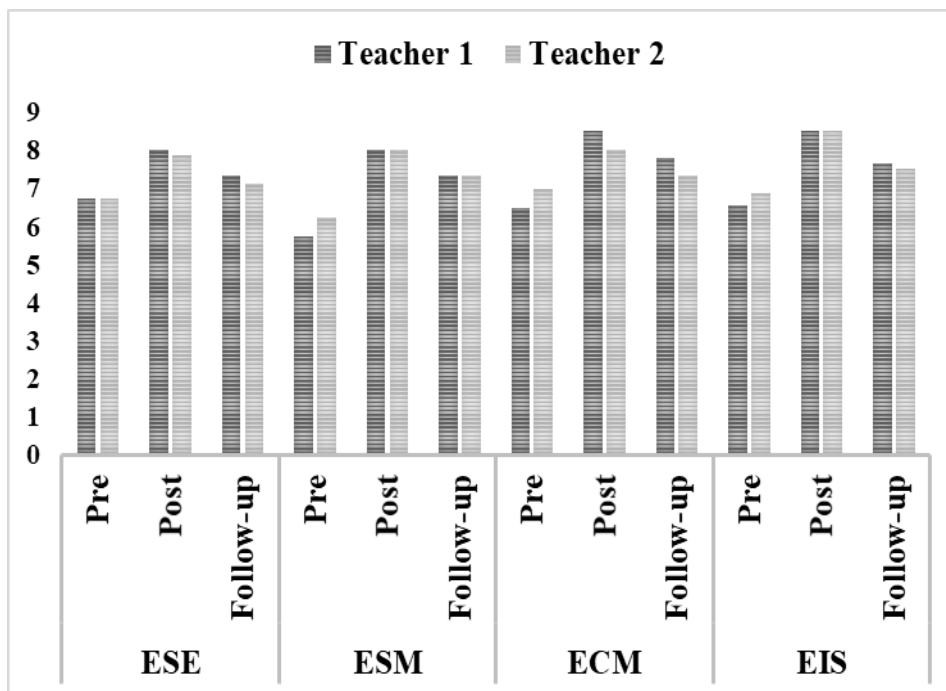


Figure 2

Average scores of the dimension of the Teachers' Sense of Efficacy Scale at the three measurement time points

Note. ESE = Efficacy for student engagement; ESM = Efficacy in students misbehaviour; ECM = Efficacy in classroom management; EIS = Efficacy in instructional strategies

DISCUSSION

Our first aim was to assess whether the teacher-focused program could affect students' perception of classroom motivational climate. Currently, there is a lack of studies assessing the effect of interventions involving teachers' reflection and/or TSE on students' perceived MC. Experimental research conducted by Kierner et al. (2015), Langdon et al. (2017), and Haji Hassan and Morgan (2015) with different populations showed significant changes in the motivation of students and athletes whose teachers and coaches took part in intervention programs. Our results are in contrast with them, as MC only increased significantly at the follow-up measurement. A main difference between those works and ours lies in the fact that they were based on a practice-focused intervention program (i.e., teachers were shown practical activities, rather than reflecting on their own), whereas the teachers in our sample only received expert guidance on how and what to observe in their classroom, with the intention to enhance

their critical thinking at the same time as their freedom and teaching philosophy are kept intact. It is possible that, due to the theoretical nature of our intervention program, the time needed for the VBR to translate into real changes of classroom practices was delayed, hence influencing in-class climate at a later moment. Leal-Soto et al. (2023) point out that there may be secondary variables influencing MC, for instance, the school's overall aims, as well as teachers' satisfaction with their job and the school. Although the school was still the same at the follow-up measurements, testing was carried out during a new semester, hence school's main aims could have changed the overall educational approach. Nonetheless, a wide body of literature considers TSE (or its dimensions individually or in combination) to be the major actor in MC changes (Alonso-Tapia and Ruiz-Diaz, 2022; Bracho-Amador et al., 2023; Hettinger et al., 2023; Leal-Soto et al., 2023). An interesting point is brought by Hettinger, Lazarides, and Schiefele (2023). The authors tracked TSE and students' perceived climate and interest towards mathematics over 18 months, finding out that TSE at the beginning of the study predicted students' approach to the subject 18 months later. Considering that in our study average TSE scores increased after six months, but changes in MC were seen only after twelve months, it seems plausible that the effect of the program and the changes in our teachers' TSE took time to become effective, like the above-mentioned study.

Regarding TSE, at the beginning ESM was the weakest domain for both teachers. At post-test, all TSE domains reached above average or almost the highest scores for both participants, suggesting that our intervention may have had a positive effect on general TSE. Our findings are congruent with other studies involving both TSE and VBR programs. For instance, Meyer (2012) reported increased TSE changes in primary school teachers after participating in an online reflective course. Similarly, Harford, MacRuar, and McCartan (2010) found that participating in a peer-reviewed video process significantly improved in TSE domains including planning and preparation for differentiation, teaching and learning, and classroom management. More recently, Gold (2017) found teachers participating in VBR trainings to have a significantly higher latent increase in both TSE in classroom management and TPV. As some authors propose, the participation of experts in reflective discussions with the teachers may explain our findings (Brown and Kennedy 2011; Kleinknecht and Groschner 2016; Reuker 2017b). As a result of such expert/teacher interactions, it is possible that teachers felt better prepared to manage their classrooms and students' behaviour effectively (Little and Hudson 1998). Interestingly, at follow-up TSE remained higher than at pre-test, yet it decreased compared to post-test. There is little research following the variations of TSE after the implementation of interventions and the corresponding post-tests. Hoogendijk et al. (2018) found out that five months after the implementation of a teacher-focused program, TSE improvements were almost fully lost, potentially due to the fact the participants were working with new students, this changing the in-class conditions. Out of the school context, authors have obtained contrasting results on self-efficacy long-term changes (McAllister et al. 2018; Rader et al. 2017; Zhou et al. 2018). As our teachers were assisted by the experts throughout the whole process, every cycle of video analysis ended with a joint session in which they gave teachers feedback, advice, and comments on best practices in the classroom. This may have led to the teachers in our sample partially relying on experts' suggestions; therefore, they might

have felt less autonomous, and less self-efficient, when taking decisions (Wilches 2007). In addition, it is also possible that the duration of our intervention was too short to allow participants to achieve full autonomy both in their reflective practices and their subsequent decisions. Another reason for the decrease of TSE at follow-up may be related to the contents that the teachers presented to students during the semester that followed the intervention: some of the contents that PE teachers are required to cover each semester are at times more challenging for them depending on their previous knowledge (Menon and Sadler 2016). It is possible that our teachers did not fully master the contents established for the semester following the intervention, thus reducing their TSE to a certain degree.

LIMITATIONS

This study presents some limitations. Firstly, the use of pre-experimental single-group designs reduces the robustness of the conclusions due to higher risk of biases compared to experimental ones. The choice of this design was due to environmental constraints: access to school was granted only under the circumstance that all participants would benefit of the program, excluding the possibility of crossover strategies, as well. This issue was attempted to be solved by carrying out follow-up measurements to verify the trend of TSE and MC in a non-intervention period. Another aspect is the low number of teachers involved. The use of video recordings was a condition that several teachers did not accept, and the two participants granted their consent only after their principal approved the research as a part of their mandatory yearly teacher development training. Indeed, this intervention implies extra work from the teachers and, therefore, it is bound to their time availability and to the positive disposition of other educational actors (school principals, parents, etc.), also regarding the matter of privacy. Although low-size samples may be common in studies of such nature, major advances in this field will require wider sampling and stronger designs in future research. Where possible, the use of crossover designs could represent a step forward that may provide benefits to all participants.

CONCLUSIONS

Our results support the general assumption that VBR programs may help enhance teachers' approach to their classroom and consequently improve students' perception of the in-class climate. The 3-step reflection cycle with experts' engagement seemed to have a generally positive impact. While TSE showed an increase at the end of the intervention, the slight drop at follow-up may suggest that future VBR programs should include attention to the development of teachers' autonomy, possibly by reducing the frequency or duration of the expert-teacher meetings or shifting experts' feedback from a controlling style to a more autonomy-supportive one (Reeve 2009). All in all, VBR strategies may be useful as a part of ongoing professional training programs, so to stimulate teachers' critical thinking and possibly improve their ability to learn from in-class situations and be better prepared for them (Zee & Koomen, 2019). Additionally, teachers may make use of this methodology in their classes without the assistance of researchers or external professionals, as support for their own autonomous self-

reflection, which is currently considered an essential element of teacher's education (Council of Europe, 2025).

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ETHICAL STATEMENT

This study received the ethical approval of the Secretariat of Public Education of Mexico (approval number DSA/103.5/16/10510). All participants and/or their legal representatives signed informed consents before taking part in the study.

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