Affective learning profiles in compulsory high school physical education: an instructional communication perspective

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Abstract

Affective learning is a major focus of the national K-12 physical education (PE) content standards (National Association for Sport and Physical Education [NASPE, 2004]). Understanding how students might fit into different affective learning subgroups would help extend affective learning theory in PE and suggest possible intervention strategies for teachers wanting to increase students' affective learning. The present study used cluster analysis (CA) and latent profile analysis (LPA) to develop a two-level affective learning-based typology of high school students in compulsory PE from an instructional communication perspective. The optimal classification system had ten clusters and four latent profiles. A comparison of students' class and cluster memberships showed that the two classification procedures yielded convergent results, thus suggesting distinct affective learning profiles. Students' demographic and biographical characteristics, including gender, race, body mass index, organized sport participation, and free time physical activity, were helpful in further characterizing each profile.

Keywords

profiles, perspective, learning, communication, affective, instructional, education, physical, school, high, compulsory

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Affective Learning Profiles in Compulsory High School Physical Education: An Instructional Communication Perspective

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Affective learning is a major focus of the national K-12 physical education (PE) content standards (National Association for Sport and Physical Education [NASPE, 2004]). Understanding how students might fit into different affective learning subgroups would help extend affective learning theory in PE and suggest possible intervention strategies for teachers wanting to increase students' affective learning. The present study used cluster analysis (CA) and latent profile analysis (LPA) to develop a two-level affective learning-based typology of high school students in compulsory PE from an instructional communication perspective. The optimal classification system had ten clusters and four latent profiles. A comparison of students' class and cluster memberships showed that the two classification procedures yielded convergent results, thus suggesting distinct affective learning profiles. Students' demographic and biographical characteristics, including gender, race, body mass index, organized sport participation, and free time physical activity, were helpful in further characterizing each profile.

Keywords: affective learning, instructional communication, cluster analysis, latent profile analysis, physical education

The domain of affective learning encompasses "students' attitudes, beliefs, values, and underlying emotions as they relate to the knowledge and skills they are acquiring" (Mottet & Beebe, 2006, p. 8). Affective learning constitutes a major focus of K-12 physical education (PE). Specifically, Standard Six of the National Content Standards states that students should "value physical activity for health, enjoyment, challenge, self-expression, and/or social interaction" (National Association for Sport and Physical Education [NASPE], 2004). According to NASPE (2004), "The intent of this standard is development of an awareness of the intrinsic values and benefits of participation in physical activity that provides personal meaning" (p. 14).

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Affective learning is a key educational focus because it is proposed to guide students' approach/avoidance behaviors related to subject matter content (Hatfield, Cacioppo, & Rapson, 1993). PE studies using theories of motivation seem to generally support this relationship when affective learning is defined in terms of the determinants (e.g., students' goal orientations, perceived motivational climate or social context, perceived basic need support) and outcomes (e.g., enjoyment in class, engagement in lessons, out-of-class physical activity) associated with students' in-class motivation (e.g., self-regulation, situational interest; see Chen, 2001, Standage, Gillison & Treasure, 2007, and Subramanium, 2009 for reviews of this literature). However, other theoretical perspectives are needed to elucidate additional factors that might contribute to affective learning (Webster, Mindrila, & Weaver, 2011). Moreover, most studies have taken a *variable*-centered, as opposed to a *person*-centered, approach to examining theoretical constructs related to student affect. For instance, within motivation research, Haerens, Kirk, Cardon, De Bourdeaudhuij and Vansteenkiste (2010) indicated "Whereas the primary aim of a variable-centered approach is to investigate the effect of the different motivational dimensions on outcomes, the aim of the person-centered approach is to examine how different motivational dimensions get combined with different groups of individuals, each characterized by a different motivational profile" (p. 120).

The present study was framed using theory and research originating from a subdiscipline of the communication field, called instructional communication, which "examines teaching and learning using communication theory and research conclusions to explain, predict, and control instructional outcomes" (Mottet & Beebe, 2006, p. 4). Grounded in educational psychology, pedagogy, and communication, instructional communication research has produced unique perspectives and instrumentation to examine relationships between teachers' instructional message variables and student outcomes (Myers, 2010; Waldeck, Plax, & Kearney, 2010). Studies unequivocally show that teacher communication variables are strongly associated with students' affective learning (Chesebro & Wanzer, 2006). While only one study in K-12 PE has drawn on the work of instructional communication researchers to examine affective learning (Webster, et al., 2011), the results were consistent with instructional communication studies in supporting the relationship between students' perceptions of teacher communication and affective learning, thus highlighting the importance of PE research examining theoretical constructs beyond those situated within more commonly used motivation theories.

The intent of the current study was to reanalyze data from the Webster et al. (2011) study, in which a variable-centered approach was used to examine a theoretical model explicating determinants of affective learning in compulsory high school PE from an instructional communication perspective, including students' state motivation and content relevance. Using this same theoretical frame, the current study adopted a person-centered approach to examine distinct affective learning-based student profiles.

Instructional Communication and Affective Learning

Within instructional communication research, affective learning has been defined using the work of Krathwohl, Bloom and Masia (1964; Waldeck, et al., 2010), which hierarchically organizes students' approach tendencies toward subject matter content into five levels: receiving, responding, valuing, organizing and value complex. Receiving and responding represent lower order affective responses and are exemplified by student behaviors such as attending to the teacher when being spoken to, answering the teacher's questions, and following directions. Valuing, organizing, and value complex represent higher order affective responses and are exemplified by student behaviors such as being self-directed during practice, applying knowledge and skills learned in class to other contexts, and electing to take another course offering similar content. Krathwohl et al. (1964) described the ascent from lower to higher levels of affective response as a process of internalization where "the phenomenon or value successively and pervasively becomes part of the individual" (p. 28).

Instructional communication researchers have developed numerous scales to assess affective learning consistent with Krathwohl et al.'s (1964) conceptualization. Early research mostly employed or modified scales developed by McCroskey (1966), which were found to be highly reliable (Mottet & Richmond, 1998). However, studies using these scales frequently did not separate affect for the instructor from affect for the course content, which led to inflated estimates of affective learning (McCroskey, Richmond, & McCroskey, 2006). Recognizing this, McCroskey (1994) made a clearer distinction between these variables. His measure of affective learning (i.e., affect for the content) assesses two subconstructs: (a) students' attitudes toward a class they are taking and (b) the probability of taking other classes with similar content. These subconstructs are considered to be accurate and parsimonious representations of lower and higher order affective responses, respectively, within Krathwohl et al.'s (1964) taxonomy (Mottet & Richmond, 1998; Waldeck, et al., 2010).

Instructional communication research has demonstrated strong correlations between affective learning and a range of teacher communication variables (Mottet, Richmond, & McCroskey, 2006). Most pertinent to the current study, Mottet, Garza, Beebe, Houser and Jurrells et al. (2008) found that teacher clarity and communication of content relevance were the strongest predictors of ninth graders' affective learning in math and science. A modified version of McCroskey's (1994) affective learning measure was used, which assessed students' intentions to take additional courses in these subject areas, as well as interest in pursuing careers in math- and science-related fields. Teacher clarity was defined as "a cluster of teacher behaviors that contributes to the fidelity of instructional messages" (Chesebro & Wanzer, 2006, p. 95), whereas communication of content relevance was defined as "messages that are targeted to students' needs and goals" (Mottet, et al., 2008, p. 336).

Drawing from Mottet et al.'s (2008) study and several proposed theories related to affective learning in the instructional communication literature (Allen, Witt, & Wheeless, 2006; Christophel, 1990; Frymier, 1994; Kelly & Gorham, 1988; Richmond, 1990; Rodriguez, Plax, & Kearney, 1996), Webster et al. (2011) tested a theoretical model in which content relevance was viewed as a central mediator of affective learning among high school students' enrolled in their final required PE course. The results of structural equation modeling supported the proposed relationships. Specifically, students with more state motivation (i.e., drive or effort related to the class; Richmond, 1990) perceived their teachers to use more content relevance behaviors. Students who perceived more communication of content relevance subsequently perceived the course to be more personally relevant (i.e., related to their personal interests and goals; Frymier & Shulman, 1995). When students perceived the course as more personally relevant, they also reported higher affective learning (i.e., intentions to take similar courses in the future; McCroskey, 1994) and, ultimately, intentions to use the knowledge and skills taught in the course once the course was finished (Krathwohl, et al., 1964). Since the study was conducted with high school students in their final required PE course, these outcomes are especially important with respect to the overarching goal of PE to guide youth in the process of becoming physically active for life (NASPE, 2004).

Toward an Affective-Based Student Typology

The study by Webster et al. (2011) suggests that communicating content relevance during instruction should be an area of focus for PE teachers concerned with cultivating affective learning in the context of compulsory high school PE. Yet, although the research literature offers some guidance for how K-12 PE teachers might communicate content relevance (Webster, Gonzalez, & Harvey, 2012), efforts to translate research into practice will not reach their potential without first understanding students' varied affective learning needs. Subgroups of students sharing unique combinations of responses in terms of state motivation, content relevance, and affective learning might exist. For instance, despite the general trend for students who perceived more teacher communication of content relevance to also feel the course was more personally meaningful (Webster, et al., 2011), it is possible that some students who perceived their teachers to frequently use content relevance messages still did not feel the course was personally meaningful. Research aimed at classifying subgroups of affective learners would ultimately help teachers use more differentiated instruction in class, based on students' affective learning profiles. Such research would also extend affective learning theory from an instructional communication perspective (Webster, et al., 2011) by adding a person-centered, as opposed to a variable-centered account of affective learning (Haerens, et al., 2010).

Most of studies in PE that have aimed to extend theory through a person-centered approach have focused their attention on theories of motivation using cluster analysis (CA). CA uses multiple observed variables to organize an ungrouped sample of individuals into homogeneous groups (Aldenderfer & Blashfield, 1984), resulting in a typology of individuals who have similar characteristics with those in the same cluster, while distinct from members of other clusters (Aldenderfer & Blashfield, 1984). Studies using CA in PE have helped to distinguish different motivational profiles of high school-aged students in PE classes in terms of students' in-class motivation, its determinants, and its outcomes from the perspectives of self-determination theory and achievement goal theory (e.g., Cloes, Motter, Ledent, & Pieron, 2002; Haerens, et al., 2010; Moreno, Hellin, Hellin, Cervello, & Sicilia, 2008; Ntoumanis, 2002; Spray & Wang, 2001; Ulrich-French & Cox, 2009; Wang, Biddle, & Elliot, 2007; Wang, Lim, Aplin, Chia, & McNeill, et al., 2008; Wang, Liu, Sun, Lim, & Chatzisarantis, 2010; Yli-Piipari, Watt, Jaakkola, Liukkonen, & Nurmi, 2009). For example, Ntoumanis (2002) classified students (aged 14–15) in PE from two schools in England into three clusters from a self-determination theory perspective. Students in the first cluster had adaptive motivational profiles (high self-determined motivation and low external motivation and amotivation—i.e., total lack of motivation) and experienced positive outcomes (high effort, enjoyment, and cooperation and low boredom). Students in the second cluster scored moderately on all measures. Students in the third cluster had maladaptive motivational profiles (e.g., low self-determined motivation and high amotivation) and experienced relatively negative outcomes (e.g., low effort and enjoyment and high boredom).

Several of these studies also considered students' demographic and/or biographical characteristics and have shown that motivational clusters can be further distinguished by gender (Haerens, et al., 2010; Ntoumanis, 2002; Moreno, et al., 2008; Wang, et al., 2010), physical activity participation (Cloes, et al., 2002; Haerens, et al., 2010; Wang, et al., 2010; Yli-Piipari, et al., 2009), and sport participation (Cloes, et al., 2002; Haerens, et al., 2010). Specifically, students who were male, more physically active, and more involved with sports generally had more adaptive motivational profiles than students who were female, less physically active, and less involved with sports. On a practical level, taking such characteristics into account might enhance teachers' ability to tailor their efforts aimed at increasing students' motivation.

While taking a person-centered approach to motivation research in PE illustrates the utility such an approach can have for both theoretical growth and practical application, recent literature (Beets & Foley, 2010) cautions researchers with respect to solely using CA when the aim is to classify distinct subgroups from a multidimensional perspective. A primary concern is that CA does not assign statistical criteria to identify the number of existing clusters in a data set, such that the researcher is left to determine the "correct" number of clusters (Beets & Foley, 2010). Beets and Foley (2010) therefore recommend Latent profile analysis (LPA) as an alternative multivariate classification procedure given its ability to identify latent profiles in the data. LPA assumes that a statistical model underlies the population and uses model-based probabilities to group cases. This statistical procedure recognizes that the classification process may have a certain degree of uncertainty, and calculates, for each individual, the probability of belonging to each latent category (DiStefano, 2011). However, one disadvantage of LPA is that the results typically provide very broad groups of individuals (e.g., above average, average, below average), which may not, by themselves, be very informative for practitioners. Combining LPA with CA could provide an optimal typological portrait of students within a given theoretical frame.

Purpose of the Study

Recognizing the benefits of adopting alternative theoretical perspectives to the study of affective learning in PE and the unique contributions of CA and LPA to advancing theory and practice, the purpose of the current study was to determine a two-level affective learning-based typology of high school students in a compulsory PE course from an instructional communication perspective (Webster, et al., 2011), encompassing students' state motivation, perceived teacher communication of content relevance, perceived course relevance, affective learning, and intentions to use the course content once the course was finished. In addition, since demographic and biographical variables helped to further distinguish different subgroups of students in studies using motivation-based frameworks of affective learning (Cloes, et al., 2002; Haerens, et al., 2010; Ntoumanis, 2002; Moreno, et al., 2008; Wang, et al., 2010), a secondary purpose of this study was to characterize different groups of learners based on gender, race, body mass index (BMI), organized sport participation (OSP), and free time physical activity (FTPA).

Method

Participants and Setting

Participants ($N = 636$) were students (mean age = 14.93 ± .89) enrolled in semester-long compulsory PE classes at five South Carolina high schools from three school districts. Students self-identified their sex as male (44%) or female (56%), their race/ethnicity as African American (27%), Caucasian (52%), Asian (4%), Hispanic (6%) or Other (11%), and their year in school as Freshman (84%), Sophomore (8%), Junior (3%), Senior (2%) or Not Sure (3%).

Total student enrollment at the schools ranged from approximately 1200–2000 students. The percentage of low-income students eligible for free or reduced lunch ranged from 7% to 36%. PE classes were a mix of both single gender and coeducational with no standardized curriculum. Based on casual observation, a wide range of content and varied instructional approaches were being applied in the different classes and schools participating in the study. In accordance with South Carolina educational guidelines, satisfactory completion of the course was sufficient for graduation requirements, such that future enrollment in PE at these high schools would be on an elective basis.

Instrumentation

Demographic/Biographical Information. Students reported their gender, race/ethnicity, and weight and height (used for calculating BMI) on a demographic questionnaire. OSP was measured with a single item, "Do you participate in organized sports (varsity/junior varsity, club teams, church teams, etc)?" (Webster, Monsma, & Erwin, 2010). FTPA was assessed using an item from the Health Behavior in School-aged Children survey (Booth, Okely, Chey, & Bauman, 2001). The item reads, "In your free time, how often do you do sports or exercise until you are out of breath or sweat?"

State Motivation. A modified version of Richmond's (1990) State Motivation Scale (SMS) was used to measure students' motivation to be in their PE class. Students responded to five items each using a seven-point semantic differential scale anchored by bipolar adjectives. Scale items are preceded by the question, "How do you feel in regard to this physical education class?" and include the scales of Motivated/Unmotivated, Excited/Bored, Uninterested/Interested, Uninvolved/Involved and Dread it/Look forward to it. Cronbach's Alpha coefficient for the scale items was 0.94.

Teacher Communication of Content Relevance. A modified version of Frymier and Shulman's (1995) Communication of Content Relevance Scale (CCR) was used to measure students' perceptions of their PE teacher's communication. Using the original five-point Likert scale (0 = Never; 4 = Very Often) and the stem, "My PE teacher…" students responded to six items (e.g., "Explains why PE is important to me", "Gives examples that show how PE connects to my personal life"). Cronbach's Alpha coefficient for the scale items was .88.

Perceived Content Relevance. Webster et al.'s (2011) Perceived Class Relevance Scale (PCRS) was used to measure whether students perceived what they were learning in PE class to be personally relevant. Item construction for the scale drew on Keller's (1983) definition of relevance and Frymier and Shulman's (1995) work, which identifies three main features of content relevance, including the ability of the content to satisfy personal values, goals and interests. Using a four-point Likert scale (1 = Strongly Disagree; 4 = Strongly Agree) and the stem, "The knowledge and skills I am learning in this PE class…" students responded to eight items (e.g., "Will help me reach my personal goals", "Are related to interests I have outside of class"). Cronbach's Alpha coefficient for the scale items was .86.

Affective Learning. A modified version of McCroskey's (1994) Affective Learning Scale (ALS) was used to measure students' affect for PE. Students responded to eight items each using a seven-point semantic differential scale anchored by bipolar adjectives. The first four items are intended to measure students' feelings about the content being taught in their PE class and represent lower order affective responses. These items are preceded by the stem, "I feel the content (knowledge and skills) taught in this class is…" and include the scales of Bad/Good, Worthless/Valuable, Unfair/Fair and Positive/Negative. Cronbach's Alpha coefficient for the scale items was 0.85. The second four items are intended to measure students' feelings about classes that teach similar content as their current PE class and represent higher order affective responses. These items are preceded by the stem, "My likelihood of taking future courses offering the same or similar content is…" and include the scales of Unlikely/Likely, Possible/Impossible, Improbable/Probable, and Would/Would Not. Cronbach's Alpha coefficient for the scale items was 0.93.

Intentions to Use Class Content. A modified version of Hagger, Chatzisarantis and Biddle's (2001) scale of intentions to be physically active (INT) was used to measure students' intentions to use the content taught in their physical education class after the course ended. INT in this study was viewed as a logical consequence of higher order affective learning measured by the ALS (Krathwohl, et al., 1964; Webster, et al., 2011). Students responded to three items: "After taking this course, I plan to use some or all of the knowledge/skills taught", "After taking this course, I intend to use some or all of the knowledge/skills that were taught" and "After taking this course, I am determined to use some or all of the knowledge/skills that were taught". Each item uses a seven-point semantic differential scale anchored by the bipolar adjectives Likely/Unlikely. Cronbach's Alpha coefficient for the scale items was .94.

Procedure

This study uses the same data set reported in the study by Webster et al. (2011), in which the procedures for instrument development and data collection were reported in detail. Briefly, the researchers' university review board for research with human subjects approved the study before data collection and each school district, the school principals, parents and students gave permission for the study to be conducted. The first and third authors administered the surveys with intact PE classes at the participating schools. Students were instructed that participation was voluntary, to respond to all questions, that responses would be kept confidential and that participation would not affect the students' grades in class. Students took approximately 15 minutes to complete the survey.

Data Analysis

Exploratory Factor Analysis. Exploratory factor analysis (EFA) with Maximum Likelihood (ML) estimation and Promax rotation was employed to identify the latent dimensions that underlie the data. EFA was conducted with the SPSS 19.0 software, and was followed by the computation of Bartlett factor scores for each survey scale. These coefficients indicate the location of each individual on the identified latent dimensions. They were obtained by multiplying the observed variable vector, by the inverse of the diagonal matrix of unique factor score variances, the loadings included in the factor pattern matrix, and the inverse of the matrix obtained by multiplying the factor loading matrix by the inverse of the diagonal matrix of unique factor score variances. (DiStefano, Zhu & Mindrila, 2009). Bartlett factor scores are based on maximum likelihood estimation, and constitute, therefore, unbiased estimates of the true factor scores (Hershberger, 2005). For ease of interpretation, Bartlett estimates were transformed into T scores, which have a mean of 50 and a standard deviation of 10.

Cluster Analysis (CA). EFA factor scores were used as input for CA. This multivariate classification procedure was employed to identify groups of individuals who have affective learning profiles that are similar to those in the same cluster, while distinct from members of other clusters. Clustering algorithms were conducted with the SAS 9.2 software, and consisted of Ward's hierarchical analysis (Ward, 1963), followed by the *k*-means clustering procedure. Ward's hierarchical analysis is frequently used in social sciences because it creates groups with minimal intracluster variance (Ward, 1963). Nevertheless, this classification procedure does not allow the reassignment of cases to more representative clusters throughout the classification process. To overcome this drawback, the final Ward's cluster solution was used as starting point for the *k*-means procedure, which allows cases to switch their cluster membership when they become more closely represented by a new group (MacQueen, 1967).

Three through eleven cluster solutions were examined and the final solution was chosen based on the interpretability of the cluster centroids, match of the solution to affective learning theory (Webster, et al., 2011), and cluster characteristics such as gender distribution and cluster size. After the "optimal" cluster solution was identified, variables measuring the students' BMI, OSP, and FTPA were tallied by cluster. Because clustering results may be sensitive to the order in which observations enter the analysis (Aldenderfer & Blashfield, 1984), the clustering procedures were repeated with two shuffled data sets. These data sets were obtained by randomly reordering the observations in the original sample. This internal validation procedure helped determine whether the cluster solution was replicable, or just an artifact of the data.

Latent Profile Analysis (LPA). EFA factor scores were also used to conduct LPA, a multivariate classification procedure that aims to identify the latent categories underlying the data. As opposed to CA, LPA assumes that variables are measured at the latent level (DiStefano, 2011). Analysis was conducted with the Mplus 6.11 software (Muthén & Muthén, 1998-2004), and parameters were estimated with the Robust Maximum Likelihood (MLR) method. Models with two, three, and four groups were examined. The final solution was chosen based on interpretability of group centroids, goodness of fit indices, and measures of classification precision. The fit indices used to determine how well the model fitted the data were the Akaike Information Criteria (AIC) and the Bayesian Information Criteria (BIC). Lower AIC/BIC values indicate a better model fit and higher model parsimony (Muthén, 2004; Vermunt & Magidson, 2002).

The degree of classification precision was examined using indices such as hit rates and entropy. These coefficients range between 0 and 1. Hit rates closer to 1 indicate larger percentages of correctly classified cases, whereas high entropy values indicate that the estimated classification system has clearly distinct categories (Ramaswamy, Desarbo, & Reibstein, 1993).

Comparison of CA and LPA Group Memberships. Both LPA and CA provided a group membership for every individual. A cross-tabulation of CA and LPA assignments helped construct a two-level typology of students consisting of latent profiles and clusters. In addition, this procedure helped compare the two classification systems by indicating the latent profile of the students in each cluster.

Results

Exploratory Factor Analysis

EFA revealed six dimensions underlying the data: (a) State Motivation (SM), (b) Perceived Teacher Communication of Content Relevance (CCR), (c) Perceived Content Relevance (PCR), (d) Lower Order Affective Response (LOA), (e) Higher Order Affective Response (HOA), and (f) Intentions to Use the Course Content (INT). To obtain a simple structure, three cross-loading items were successively deleted from the analysis. The final factor solution and the item loadings are reported in Table 1. Factor loadings ranged between .416 and .916, showing that the scale items had moderate to high correlations with the corresponding factors. The six factors were moderately correlated, with correlation coefficients ranging from .36 to .68.

Cluster Analysis

The final CA solution included ten groups: (a) Above Average ($N = 57$), (b) Average ($N = 106$), (c) Below Average ($N = 53$), (d) High HOA/SM ($N = 71$), (e) High LOA ($N = 74$), (f) Low CCR ($N = 87$), (g) Low HOA ($N = 61$), (h) Low HOA/INT ($N = 48$), (i) Low LOA ($N = 53$) (j) High CCR/PCR and Low SM/INT ($N = 26$). Table 2 provides the centroid information by cluster, as well as the biographical characteristics of their members.

Table 1 Item Loadings for the Identified Factors

	Factors					
Items	**SM**	**CCR**	**PCR**	**LOA**	**HOA**	**INT**
In regard to participating in this PE class, I feel. . .						
interested/ uninterested.	.889					
motivated/ unmotivated.	.725					
look forward to it/ dread it.	.722					
bored/ excited.	.643					
uninvolved/ involved.	.513					
My PE Teacher. . .						
clearly states how PE relates to my personal goals.		.862				
discusses how PE has personal value for me.		.816				
links what I learn in PE to things I enjoy in other aspects of my life.		.760				
gives examples that show how PE connects to my personal life.		.759				
helps me to apply what I learn in PE to my personal interests.		.750				
explains why PE is important for me.		.510				
The knowledge and skills I am learning in this PE class. . .						
Are important to me.			.853			
Will help me reach my personal goals.			.798			
Are related to interests I have outside of class.			.701			
Can be used in other aspects of my life.			.634			
Will help me succeed in other areas of my life.			.631			

(continued)

Table 1 *(continued)*

Items	Factors					
	SM	CCR	PCR	LOA	HOA	INT
Are not related to my personal goals. (deleted)						
Have little in common with my personal interests. (deleted)						
Are not valuable to me. (deleted)						
I feel the content (knowledge and skills) taught in this class is. . .						
unfair/ fair.				.761		
bad/ good.				.684		
positive/ negative.				.663		
valuable/ worthless.				.416		
Assume that in your high school, you can take whatever classes you prefer. My interest in taking another class similar to this physical education class is. . .						
unlikely/ likely.					.873	
improbable/ probable.					.864	
would/ would not.					.861	
possible/ impossible.					.746	
After taking this course, I *intend* to use some or all of the knowledge/skills that were taught.						.916
After taking this course, I am *determined* to use some or all of the knowledge/skills that were taught.						.787
After taking this course, I *plan* to use some or all of the knowledge/skills that were taught.						.786
Factor eigenvalue	2.59	10.29	1.84	1.05	1.61	1.28
Percentage variance explained	9.58	38.11	6.82	3.89	5.95	4.79
Total percentage variance explained			69.08			

Note: SM = State Motivation; CCR = Teacher Communication of Content Relevance; PCR = Perceived Content Relevance; LOA = Lower Order Affective Response; HOA = Higher Order Affective Response; INT = Intentions to Use Course Content

Table 2 Mean Factor Scores and Biographical Information by Cluster

	Above Average	Average	Below Avg.	High HOA/ SM	High LOA	Low CCR	Low HOA	Low HOA/ INT	Low LOA	High CCR/ PCR and Low SM/INT
	N = 57	*N* = 106	*N* = 53	*N* = 71	*N* = 74	*N* = 87	*N* = 61	*N* = 48	*N* = 53	*N* = 26
	(2)	(2)	(2)	(2)	(2)	(1)	(2)	(2)	(2)	(2)
Factors										
SM	64.22	50.89	32.56	59.42	54.64	46.63	49.53	46.04	45.88	39.91
CCR	61.39	54.40	37.30	45.84	59.30	40.92	47.74	44.28	51.38	61.27
PCR	61.77	52.87	34.78	54.91	56.20	44.05	49.01	40.93	45.41	60.83
LOA	61.75	49.34	36.78	56.28	60.05	45.78	53.46	51.02	35.47	41.92
HOA	62.93	53.18	36.66	59.18	54.56	52.60	39.13	38.06	44.76	47.36
INT	61.26	53.13	35.01	51.50	58.54	45.66	55.04	37.55	50.42	39.53
Males	60%	50%	26%	58%	43%	43%	30%	27%	47%	63%
Females	40%	50%	74%	42%	57%	57%	70%	73%	53%	38%
African American	27%	24%	29%	16%	34%	24%	32%	23%	35%	33%
White Caucasian	55%	51%	48%	70%	50%	56%	54%	50%	39%	42%
Asian American	2%	7%	6%	3%	1%	2%	2%	8%	6%	4%
Hispanic	4%	8%	4%	1%	7%	2%	7%	8%	12%	8%
BMI ≤ 25	16%	17%	15%	13%	26%	21%	20%	21%	26%	31%
BMI > 25	84%	83%	85%	87%	74%	79%	80%	79%	74%	69%
OSP	81%	68%	62%	79%	66%	56%	48%	36%	52%	75%

(continued)

Table 2 *(continued)*

	Above Average	Average	Below Avg.	High HOA/ SM	High LOA	Low CCR	Low HOA	Low HOA/ INT	Low LOA	High CCR/ PCR and Low SM/INT
	N **= 57**	***N*** **= 106**	***N*** **= 53**	***N*** **= 71**	***N*** **= 74**	***N*** **= 87**	***N*** **= 61**	***N*** **= 48**	***N*** **= 53**	***N*** **= 26**
	(2)	**(2)**	**(2)**	**(2)**	**(2)**	**(1)**	**(2)**	**(2)**	**(2)**	**(2)**
FTPA										
Never	2%	0%	12%	1%	3%	2%	3%	4%	10%	8%
Less than once per month	0%	2%	12%	1%	3%	8%	10%	15%	6%	12%
Once per week	4%	14%	10%	3%	14%	20%	20%	19%	20%	0%
2–3 times per week	18%	35%	29%	17%	26%	24%	24%	40%	18%	12%
4–6 times per week	25%	16%	15%	43%	27%	23%	27%	13%	18%	12%
Every day	53%	33%	23%	33%	27%	23%	15%	10%	29%	58%

Note: Values that differ from the mean by approximately one standard deviation or more (regardless of direction) are bolded. Numbers in parenthesis indicate whether the group was replicated with one or two shuffled data sets. SM = State Motivation; CCR = Teacher Communication of Content Relevance; PCR = Perceived Content Relevance; LOA = Lower Order Affective Response; HOA = Higher Order Affective Response; INT = Intentions to Use Course Content. Numbers in parenthesis represent the number of CA runs with shuffled data sets in which the group was identified.

The Above Average cluster had average factor scores that were more than one standard deviation above the mean on all factors and had the highest proportion of students who participated in organized sports (81%). Most of the students in this group were males (60%), and the great majority of them (96%) engaged in FTPA at least 2–3 times per week.

The Average cluster was the largest (16.7% of the sample), had average factor scores close to the mean of 50 on all factors, and a roughly equal gender distribution. Approximately two thirds of these students participated in organized sports (68%) and 84% engaged in FTPA at least 2–3 times per week.

The Below Average cluster recorded average factor scores that were more than one standard deviation below the mean and had the largest proportion of females (74%). Approximately 67% of the students in this cluster participated in FTPA at least 2–3 times per week, and more than half of these students participated in organized sports (62%).

The High HOA/SM group recorded high average factor scores on the HOA and SM factors, whereas the other factor scores were close to the average. This group consisted mostly of males (58%), and the great majority of them participated in organized sports (79%). This cluster had the highest proportion (93%) of students who engaged at least 2–3 times per week in FTPA.

Students in the High LOA cluster have high scores on the LOA factor, as well as the CCR and INT factors. This group is predominantly female (57%), and a large proportion of it participates in organized sports (66%) and engages in FTPA at least 2–3 times per week (80%).

The Low CCR cluster had an average factor score that was approximately one standard deviation below the mean on the CCR factor, and average scores that were slightly below average on the other factors. This group was predominantly female (57%). Approximately half of it participated in organized sports (56%) and 70% engaged in FTPA 2–3 times per week or more.

Students in the Low HOA group had low scores on the HOA factor, and scores that were close to average on the other factors. The large majority of this group consisted of females (70%). Less than half of the students in this cluster participated in organized sports (48%), and only 66% of them participated in FTPA 2–3 times per week or more.

Students in the Low HOA/INT cluster had low average factor scores on the HOA, INT, and PCR factors. This group had a large proportion of females (73%), the lowest proportion of students who participated in organized sports (36%), and the lowest proportion of students who engaged in FTPA 2–3 times per week or more (63%).

The Low LOA cluster had low average factor scores on the LOA factor, and close to average factor scores on the other factors. The gender distribution in this cluster was approximately equal (53% female). Only 52% of these students participated in organized sports, and 65% engaged in FTPA at least 2–3 times per week.

The High CCR/PCR and Low SM/INT cluster consisted of students with high scores on the CCR and PCR factors, and low scores on the INT, SM factors. This cluster was the smallest group (4.1% of the sample), and had the largest proportion of males (63%). The great majority of the students in this group participated in organized sports (75%) and engaged in FTPA at least 2–3 times per week (82%).

Students' BMI and the racial distribution were also tallied by cluster. However, given the relatively large proportion of students with high BMIs in the sample, the proportion of students with BMI > 25 ranged only between 69% (for the High CCR/PCR and Low SM/INT cluster) and 87% (for the High HOA/SM cluster). Similarly, the majority of students in the sample identified themselves as Caucasian. However, these proportions varied between 39% (the Low LOA cluster) and 70% (the High HOA/SM cluster).

Internal validation procedures showed that all of the clusters described above were replicated with the first shuffled data set, and nine of the ten groups were identified with the second shuffled data set. These findings indicate that the typology obtained with this classification method was not an artifact of the data (Aldenderfer & Blashfield, 1984).

Latent Profile Analysis

The optimal LPA solution included four latent profiles: (a) Above Average ($N = 229$), (b) Average ($N = 314$), (c) Unmotivated ($N = 17$) and (d) Below Average ($N = 76$). This solution was easily interpretable and had the lowest AIC (AIC = 27247.67) and BIC (BIC = 27394.70) values from the models examined, thus suggesting that the four-profile model achieved the best model fit with a minimum number of latent categories. This model also had the highest entropy (0.83), indicating that the four profiles were clearly distinguished. Furthermore, hit rates were 90% for the Unmotivated latent profile, and 91% for the Above Average, Average, and Below Average groups. These values indicate a high degree of classification precision.

As shown in Table 3, all mean factor scores were above the average of 50 for the Above Average group, close to 50 for the Average group, and 1–1.5 standard deviations below the mean for the Below Average group. In contrast, students in the Unmotivated group did not have similar average scores on all factors. Although they had high scores on the CCR and PCR factors, their average scores on the SM and INT and LOA factors were low.

Table 3 Mean Factor Scores for Each Latent Profile

	Above Average ($N = 229$)	Average ($N = 314$)	Unmotivated ($N = 17$)	Below Average ($N = 76$)
SM	58.00	48.50	36.65	35.74
CCR	56.07	47.86	59.42	38.44
PCR	57.33	47.42	63.34	35.50
LOA	57.83	47.70	38.35	39.07
HOA	57.59	47.55	49.72	37.60

Note. Values that differ from the mean by approximately one standard deviation or more (regardless of direction) are bolded. SM = State Motivation; CCR= Teacher Communication of Content Relevance; PCR = Perceived Content Relevance; LOA = Lower Order Affective Response; HOA = Higher Order Affective Response; INT = Intentions to Use Course Content

Comparison of CA and LPA Group Memberships

The distribution of clusters across latent profiles is illustrated in Figure 1. Approximately one third of the sample was assigned to the Above Average latent profile (36.0%). Most of these students were classified in the High LOA (11.5%), Above average (9.0%), and High HOA/SM (8.0%) clusters. The majority of the students in the Average latent profile (49.4%) were included in the Low CCR (13.2), Average (10.1%), Low HOA (8.8%), and Low LOA (7.4%) clusters. Almost all students in the Unmotivated latent profile (2.7%) were assigned to the High CCR/PCR and Low SM/INT cluster (2.4%). The Below Average latent profile (11.9%) was predominantly located in the Below Average (8.3%) and Low HOA/INT (2.5%) clusters.

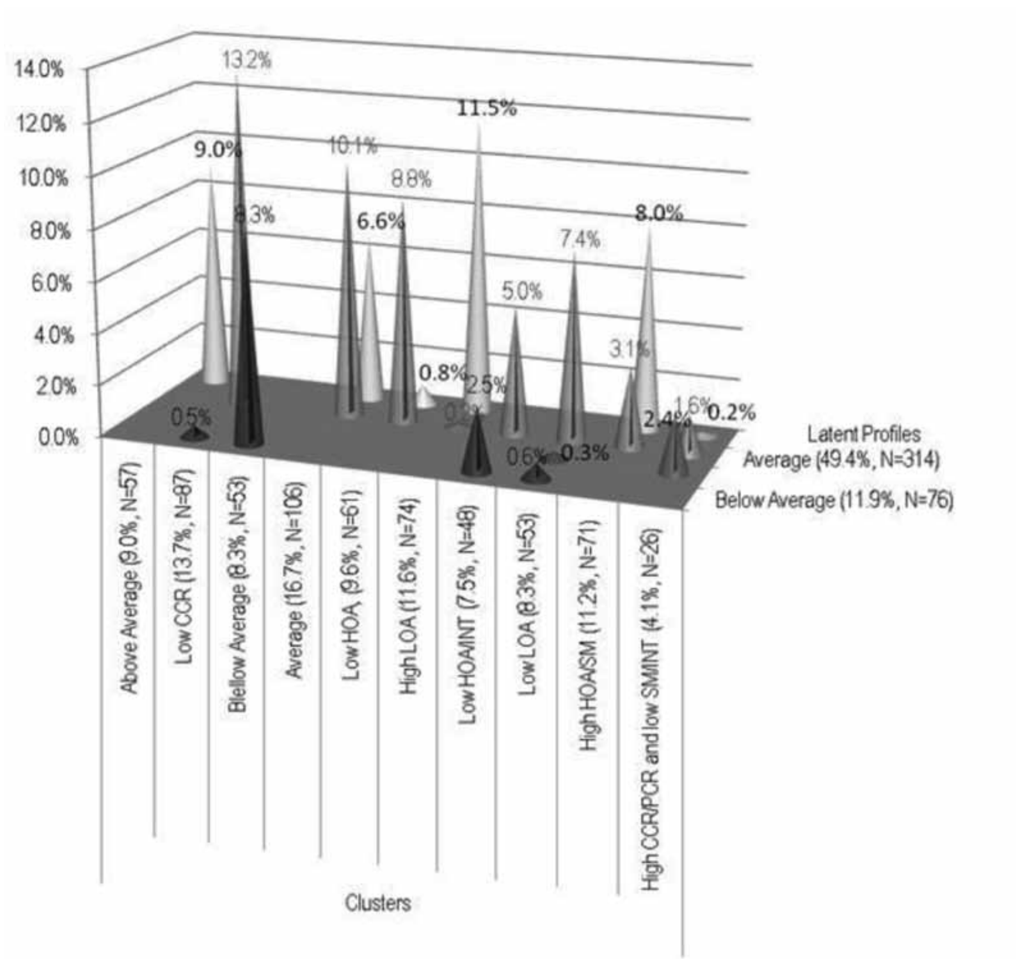

Figure 1 — Student Distribution Across Clusters and Latent Profiles.

Discussion

This study aimed to develop a two-level typology of high school students in their final required PE course using a multidimensional framework informed by instructional communication research (Mottet, et al., 2008; Mottet, et al., 2006) and affective learning theory (Krathwohl, et al., 1964; Webster, et al., 2011). Two multivariate classification procedures, CA and LPA, were used because each has unique strengths in its ability to characterize student profiles (DiStefano, 2011). The results build on an established knowledge base that focuses on students' motivational profiles in high school PE (Cloes, et al., 2002; Haerens, et al., 2010; Moreno, et al., 2008; Ntoumanis, 2002; Spray & Wang, 2001; Ulrich-French & Cox, 2009; Wang, et al., 2007; Wang, et al., 2008; Wang, et al., 2010; Yli-Piipari, et al., 2009), given that motivation can be conceptualized as part of the broad domain of affective learning (Krathwohl, et al., 1964; Rodriguez, et al., 1996). This is the first study to identify student subgroups using an instructional communication perspective of affective learning in PE (Webster, et al., 2011).

The two classification procedures yielded convergent results, showing that the identified groups were not artifacts of the classification procedures (Aldenderfer & Blashfield, 1984). Multivariate classification techniques rely on the assumption that behaviors have a continuous distribution in the population and cannot be forced to fall into perfectly distinct categories (Aldenderfer & Blashfield, 1984). Therefore, clusters were expected to spread across latent profiles. Although members of the same clusters who were located in different latent categories shared the same affective learning profile, they differed in the strength of their characteristics. CA and LPA results were thus complementary and provide two layers of information, respectively: (a) distinct affective learning profiles that might be frequently encountered among high school students in compulsory PE, and (b) the strength of these profiles' defining characteristics.

The results confirm the utility of taking a person-centered approach to theory-driven research (Haerens, et al., 2010). Using a variable-centered approach, Webster et al. (2011) supported a theoretical model in which relationships between instructional communication-based constructs and affective learning suggested a clear trend for students who have higher state motivation to also perceive more teacher communication of content relevance, perceive the course as more personally relevant, have more positive affect toward similar courses (i.e., the subject matter), and have stronger intentions to use the course content once the course was finished. However, the current study shows that variations in this trend exist beneath the surface, and that certain variations converge in definitive ways to form an underlying palette of learning profiles. Such profiles represent student subgroups, each characterized by particular and predictable learning needs that warrant focused attention in the PE classroom. For instance, it is untenable to assume that increasing content relevance messages will necessarily increase students' intentions to use the course content, as there was a distinct subgroup that scored high on both content relevance measures but low on intentions.

Students' demographic and biographical characteristics were helpful in further distinguishing the identified affective learning profiles. For instance, females were predominant in groups with low average factor scores. These groups also had lower proportions of students who participated in organized sports and who frequently engaged in FTPA. Conversely, students who reported participating in sports and/or FTPA were usually predominant in groups with high factor scores. These results resonate with motivation-based classification studies that have considered students' demographic and/or biographical characteristics (Cloes, et al., 2002; Haerens, et al., 2010; Ntoumanis, 2002; Moreno, et al., 2008; Wang, et al., 2010; Yli-Piipari, et al., 2009) and emphasize that high school PE tends to be tailored for boys more than girls, sport participants more than nonparticipants, and students who are more active than less active. It is therefore arguable that PE is misguided in its efforts, as those who need the most help in developing approach tendencies toward physical activity seem to be getting the least from their experiences in PE.

While most students who reported participating in organized sports and/or FTPA were in clusters with high factor scores, the High CCR/ PCR and Low SM/ INT cluster was an exception. Students in this group were aware of the importance of their PE class, were receptive to their teachers' communication of content relevance, were highly active, and had the lowest BMIs. However, they were not motivated for the PE class and did not intend to apply the content learned in this class in the future. A possible explanation could be that participation in organized sports gave these students the opportunity to acquire knowledge and skills that were more advanced than the content learned in the PE. Logical consequences of having a higher level of knowledge/skill than what is offered in class are boredom and disinterest, which are two of the response selections indicating low state motivation on the scale used for this study. Moreover, it seems intuitive that students who already surpass the course content would not foresee much opportunity to apply the content at their current level of understanding and performance. Although very small, this subgroup was also identified with LPA, indicating that this affective learning profile truly existed in the investigated sample and was not simply an artifact of the classification procedure.

This study has several limitations. First, anthropometric measures of weight and height were not obtained to verify students' self-reported information. Second, content coverage was not monitored and therefore presents a potential confounding variable. Student subgroups might form partly in response to the nature of the course curriculum. It would be both theoretically and practically helpful to determine what content students in the different classes were being taught so that affective learning profiles could be examined in relation to specific knowledge, skills and activities. Third, all data used in this study were collected from students in their PE classes. These data may not be an accurate portrayal of teachers' actual use of content relevance messages in these classes or students' actual use of the course content once the course was finished. To further establish the importance of the teacher's communication of content relevance and affective learning in compulsory high school PE, future investigations should incorporate observations of teacher behavior and follow up with students after the course to see whether they are applying knowledge and skills that were taught in class. Internal validation procedures and the comparison of CA and LPA classification results provided evidence that the identified groups truly existed in the sample, and were not just an artifact of the data or the computation procedures. Nevertheless, classification results must be replicated with other samples to provide evidence of external validity and to support the generalizability of the identified typology. Finally, while examining content relevance in this study and in the Webster et al. (2011) study has helped to extend the PE literature related to affective learning, future research should pursue other communication variables that could further distinguish affective learning profiles in PE. For instance, instructional communication research has identified teacher clarity and nonverbal immediacy (perceived physical and/or psychological closeness/approachability of the teacher) as two teacher communication variables that are linked to secondary students' affective learning in other subject areas (Mottet, et al., 2008; Plax, Kearney, McCroskey, & Richmond, 1986).

In conclusion, the current study has theoretical, methodological and practical significance. In terms of its theoretical contribution, this study provides an inventory of affective learning profiles informed by instructional communication theory and research, thus extending the existing PE literature in which students were classified using motivation theories. Methodologically, the use of LPA in this study is a step forward in PE research aiming to establish student typologies within multidimensional frameworks. Finally, this study has practical significance because it provides a person-centered account of affective learning in compulsory PE that teachers and teacher educators should be able to draw from to make more informed decisions about how to increase the affective learning potential of students who belong to specific subgroups. The average factor scores and demographic/biographical characteristics of the identified groups can be used in the PE classroom to identify students who have similar characteristics and to design intervention strategies that employ the strengths and target the weaknesses of each group.

References

Allen, M., Witt, P.L., & Wheeless, L. (2006). The role of teacher immediacy as a motivational factor in student learning: Using meta-analysis to test a causal model. *Communication Education, 55,* 21–31. doi:10.1080/03634520500343368

Aldenderfer, M.S., & Blashfield, R.K. (1984). *Cluster Analysis*. Beverly Hills, CA: Sage.

Beets, M.W., & Foley, J.T. (2010). Comparison of 3 different analytic approaches for determining risk-related active and sedentary behavioral patterns in adolescents. *Journal of Physical Activity and Health, 7,* 381–392.

Booth, M.L., Okely, A.D., Chey, T., & Bauman, A. (2001). The reliability and validity of the physical activity questions in the WHO Health Behaviour in Schoolchildren (HBSC) Survey: A population study. *British Journal of Sports Medicine, 35,* 263–267. doi:10.1136/bjsm.35.4.263

Chen, A. (2001). A theoretical conceptualization for motivation research in physical education: An integrated perspective. *Quest, 53,* 35–58. doi:10.1080/00336297.2001.10491729

Chesebro, J.L., & Wanzer, M. (2006). Instructional message variables. In T. Mottet, V.P. Richmond, & J.C. McCroskey (Eds.), *The Handbook of Instructional Communication: Rhetorical and Relational Perspectives*. Needham Heights, MA: Allyn & Bacon.

Christophel, D.M. (1990). The relationships among teacher immediacy behaviors, student motivation, and learning. *Communication Education, 37,* 323–340. doi:10.1080/03634529009378813

Cloes, M., Motter, P., Ledent, M., & Pieron, M. (2002). Analysis of variables related to intrinsic motivation in a boys' physical education class. *Avante, 8*(1), 1–14.

DiStefano, C. (2011). Clustering and classification. In B. Laursen, T. Little, & N. Card (Eds.), *Handbook of developmental research methods* (pp. 621-644). New York: The Guilford Press.

DiStefano, C., Zhu, M., & Mîndrilă, D. (2009). Understanding and using factor scores: Considerations for the applied researcher, *Practical Assessment, Research & Evaluation, 14*(20). Available online:http://pareonline.net/getvn.asp?v=14&n=20.

Frymier, A.B. (1994). A model of immediacy in the classroom. *Communication Quarterly, 42,* 133–144. doi:10.1080/01463379409369922

Frymier, A.B., & Shulman, G.M. (1995). "What's in it for me?": Increasing content relevance to enhance students' motivation. *Communication Education, 44,* 40–50. doi:10.1080/03634529509378996

Haerens, L., Kirk, D., Cardon, G., De Bourdeaudhuij, I., & Vansteenkiste, M. (2010). Motivational profiles for secondary school physical education and its relationship to the adoption of a physically active lifestyle among university students. *European Physical Education Review, 16*(2), 117–139. doi:10.1177/1356336X10381304

Hagger, M., Chatzisarantis, N., & Biddle, S.J. (2001). The influence of self-efficacy and past behavior on physical activity intentions of young people. *Journal of Sports Sciences, 19,* 771–725. doi:10.1080/026404101524755847

Hatfield, E., Cacioppo, J.L., & Rapson, R.L. (1993). Emotional contagion. *Current Directions in Psychological Science, 2,* 96–99. doi:10.1111/1467-8721.ep10770953

Hershberger, S.L. (2005). Factor scores. In B.S. Everitt & D.C. Howell (Eds.), *Encyclopedia of Statistics in Behavioral Science* (pp. 636–644). New York: John Wiley.

Keller, J.M. (1983). Motivational design of instruction. In C.M. Reigeluth (Ed.), *Instructional design theories: An overview of their current status* (pp. 383–434). Hillsdale, NJ: Lawrence Erlbaum.

Kelly, D.H., & Gorham, J. (1988). Effects of immediacy on recall of information. *Communication Education, 37,* 198–207. doi:10.1080/03634528809378719

Krathwohl, D.R., Bloom, B.S., & Masia, B.B. (1964). *Taxonomy of educational objectives: The classification of educational goals. Handbook II: The affective domain*. New York: David McKay.

MacQueen, J.B. (1967). Some methods for classification and analysis of multivariate observations. *Proceedings of the fifth Berkeley Symposium on Mathematical Statistics and Probability, 1,* 211-297.

McCroskey, J.C. (1966). *Experimental studies of effects of ethos and evidence in persuasive communication*. Unpublished doctoral dissertation, Pennsylvania State University.

McCroskey, J.C. (1994). Assessment of affect toward communication and affect toward instruction in communication. In S. Morreale and M. Brooks (Eds.), *1994 SCA summer conference proceedings and prepared remarks* (pp. 55-71). Annandale, VA: Speech Communication Association.

McCroskey, J.C., Richmond, V.P., & McCroskey, L.L. (2006). The role of communication in instruction: The first three decades. In B.M. Gale, R.W. Preiss, N. Burrell, & M. Allen (Eds.), *Classroom communication and instructional processes: Advances through meta-analysis*. Mahwah, NJ: Lawrence-Erlbaum Associates.

Moreno, J. A., Hellín, P., Hellín, G., Cervelló, E., y Sicilia, A. (2008). Assessment of motivation in Spanish physical education students: Applying achievement goals and self-determination theories. *The Open Education Journal, 1,* 15-22.

Mottet, T.P., & Beebe, S.A. (2006). Foundations of instructional communication. In T.P. Mottet, V.P. Richmond, & J.C. McCroskey (Eds.), *Handbook of instructional communication: Rhetorical and relational perspectives* (pp. 3–32). Boston: Allyn and Bacon.

Mottet, T.P., Garza, R., Beebe, S.A., Houser, M.L., Jurrells, S., & Furler, L. (2008). Instructional communication predictors of ninth-grade students' affective learning in math and science. *Communication Education, 57,* 333–355. doi:10.1080/03634520801989950

Mottet, T.P., & Richmond, V.P. (1998). New is not necessarily better: A reexamination of affective learning measurement. *Communication Research Reports, 15,* 370–378. doi:10.1080/08824099809362136

Mottet, T.P., Richmond, V.P., & McCroskey, J.C. (2006). Assessing instructional communication. In T.P. Mottet, V.P. Richmond, & J.C. McCroskey (Eds.), *Handbook of instructional communication: Rhetorical and relational perspectives* (pp. 283-307). Boston: Allyn and Bacon.

Muthén, B. (2004). Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. In D. Kaplan (Ed.), *Handbook of quantitative methodology for the social sciences* (pp. 345–368). Newbury Park, CA: Sage.

Muthén, L.K. & Muthén, B. (1998-2004). Mplus User's Guide. Third Edition. Los Angeles, CA: Muthén & Muthén.

Myers, S.A. (2010). Instructional communication: The emergence of a field. In D.L. Fassett & J.T. Warren (Eds.), *The SAGE handbook of communication and instruction* (pp. 149–159). Los Angeles: Sage.

National Association for Physical Education and Sport [NASPE], (2004). *Moving into the future: National standards for physical education* (2nd Ed.). Reston, VA: Author.

Ntoumanis, N. (2002). Motivational clusters in a sample of British physical education classes. *Psychology of Sport and Exercise, 3,* 177–194. doi:10.1016/S1469-0292(01)00020-6

Plax, T.G., Kearney, P., McCroskey, J.C., & Richmond, V.P. (1986). Power in the classroom VI: Verbal control strategies, nonverbal immediacy and affective learning. *Communication Education, 35,* 43–55. doi:10.1080/03634528609388318

Ramaswamy, V., Desarbo, W.S., & Reibstein, D.J. (1993). An empirical pooling approach for estimating marketing mix elasticities with PIMS data. *Marketing Science, 12,* 103–124. doi:10.1287/mksc.12.1.103

Richmond, V.P. (1990). Communication in the classroom: Power and motivation. *Communication Education, 39,* 181–195. doi:10.1080/03634529009378801

Rodriguez, J.L., Plax, T.G., & Kearney, P. (1996). Clarifying the relationship between teacher nonverbal immediacy and student cognitive learning: Affective learning as the central causal mediator. *Communication Education, 45,* 293–305. doi:10.1080/03634529609379059

Spray, C.M., & Wang, C.K.J. (2001). Goal orientations, self-determination, and pupils' discipline in physical education. *Journal of Sports Sciences, 19,* 903–913. doi:10.1080/026404101317108417

Standage, M., Gillison, F., & Treasure, D.C. (2007). Self-determination and motivation in physical education. In M.S. Hagger & N.L.D. Chatzisarantis (Eds.), *Self-determination theory in exercise and sport* (pp. 71–85). Champaign, IL: Human Kinetics.

Subramanium, R. (2009). Motivational effects of interest on student engagement and learning in physical education. *International Journal of Physical Education, 46,* 11–19.

Ulrich-French, S., & Cox, A. (2009). Using cluster analysis to examine the combinations of motivation regulations of physical education students. *Journal of Sport & Exercise Psychology, 31,* 358–379.

Vermunt, J.K., & Magidson, J. (2002). Latent class cluster analysis. In J.A. Hagenaars & A.L. McCutcheon (Eds.), *Applied latent class analysis* (pp. 89–106). Cambridge: Cambridge University Press.

Wang, C.K.J., Biddle, S.J.H., & Elliot, A.J. (2007). The 2 X 2 achievement goal framework in a physical education context. *Psychology of Sport and Exercise, 8,* 147–168. doi:10.1016/j.psychsport.2005.08.012

Wang, C.K., Lim, B.S., Aplin, N.G., Chia, Y.H.M., McNeil, M., & Tan, W.K. (2008). Students' attitudes and perceived purposes of physical education in Singapore: Perspectives from a 2 X 2 achievement goal framework. *European Physical Education Review, 14*(1), 51–70. doi:10.1177/1356336X07085709

Wang, C.K.J., Liu, W.C., Sun, Y., Lim, B.S.C., & Chatzisarantis, N.L.D. (2010). Chinese students' motivation in physical activity: Goal profile analysis using the traditional achievement goal theory. *International Journal of Sport and Exercise Psychology, 8*(3), 284–301. doi:10.1080/1612197X.2010.9671954

Waldeck, J.H., Plax, T.G., & Kearney, P. (2010). Philosophical and methodological foundations of instructional communication. In D.L. Fassett & J.T. Warren (Eds.), *The sage handbook of communication and instruction* (pp. 161–180). Thousand Oaks, CA: Sage Publications.

Ward, J.H. (1963). Hierarchial grouping to optimize an objective function. *Journal of the American Statistical Association, 58,* 236–244. doi:10.1080/01621459.1963.10500845

Webster, C.A., González, S., & Harvey, R. (2012). Physical education teachers' self-reported communication of content relevance. *Physical Educator, 69*(1), 89–103.

Webster, C.A., Monsma, E., & Erwin, H. (2010). The role of biographical characteristics in preservice classroom teachers' physical activity promotion attitudes. *Journal of Teaching in Physical Education, 29*, 358-377.

Webster, C.A., Mîndrilă, D., & Weaver, G. (2011). The influence of state motivation, content relevance and affective learning on high school students' intentions to utilize class content following completion of compulsory physical education. *Journal of Teaching in Physical Education, 30*(3), 231–247.

Yli-Piipari, S., Watt, A., Jaakkola, T., Liukkonen, J., & Nurmi, J. (2009). Relationships between physical education students' motivational profiles, enjoyment, state anxiety, and self-reported physical activity. *Journal of Sports, Science, and Medicine, 8,* 327–336.