South African Journal for Research in Sport, Physical Education and Recreation Social Sciences, 2023, 45(1): 62 - 74.
ISBN: 0379-9069
www.sajrsper.com

VALIDATION OF THE TEACHING BELIEFS SCALE OF POSTMODERN PHYSICAL EDUCATION

Wei-Yuan SHIH[1], Yih-Lih PU[1], Tu-Kuang HO[2]

[1]*Center for Teacher Education and Career Development, University of Taipei, Taipei City, Taiwan*

[2]*Institute of Physical Education and Health, Yulin Normal University, Yulin City, China*

ABSTRACT

For physical education (PE) teachers, teaching beliefs are vital to improving students' aptitude, encouraging teachers and students to develop an equal relationship, and identifying and eliminating the differences between students'perspectives and learning styles through consultation and dialogue to improve and advance teaching. Therefore, developing a PE-related teaching belief scale from a postmodern perspective is essential for PE development. This study adopted stratified random sampling to select 144 PE teachers for the exploratory factor analysis. We distributed a second round of questionnaires to 418 PE teachers from Taipei, who were randomised into two clusters for confirmatory factor analysis in terms of competing models (n=209) and cross-validation (n=209). The Teaching Beliefs Scale of Postmodern Physical Education demonstrated satisfactory reliability and validity. The internal model structure showed factor loadings of .70–.90, composite reliability values of .89–.94, and average variance extracted values of .62–.74. In adherence to the concept of postmodernism, all statistical data met the threshold conditions and hierarchy, and the four constructs (innovation, reflection, pluralism and criticism) were met. In the future, this scale can be applied to evaluate the development of teachers' beliefs about teaching PE in the postmodern era.

Keywords: Competing models; Postmodernism; Teaching beliefs

INTRODUCTION

The term 'teaching beliefs' refers to a teacher's opinions of or psychological inclination towards the role of teachers, pedagogical approaches and curriculum content and guides the development of teaching content (Faidah *et al.*, 2019; Heuckmann *et al.*, 2018; Shih *et al.*, 2017). Teachers' beliefs are also changed by the accumulation of practical experience and internal reflection and are projected on real-world teaching-related actions to meet the learning needs of students from different backgrounds (Bahcivan & Cobern, 2016; Conti, 1989; Dick, 1997; Faidah *et al.*, 2019; Hadi, 2020; Heuckmann *et al.*, 2018; Moseley *et al.*, 2016; Muhtarom *et al.*, 2019). However, fixed and unchanging teaching content limits the development of teaching beliefs (Cuban, 2016; Doll, 1993). Based on this and following the concept of

postmodernism, the primary purpose of this research was to construct and validate a physical education (PE) teaching belief scale to guide PE staff in continually innovating teaching content, thereby meeting the learning needs of students.

Postmodernism advocates that school education should break the traditional educational principles of authoritarianism, generalisation and stereotyping; tolerate divergence; and reject hegemonic ideology (i.e., unchanged curricula and a teacher-centred learning environment), thus allowing students of different regions, races, cultures, religions, classes and genders to cultivate self-awareness to independently express emotions, feelings and ideas through adaptive education (Cherryholmes, 1988; Doll, 1993). Therefore, postmodern teaching beliefs prioritise the teacher engagement of students according to their aptitude and encourage teachers and students to develop an equitable relationship and identify and eliminate the differences between students' perspectives and learning styles through consultation and dialogue to improve and advance teaching (Doll, 1993). In the case of PE teachers, by projecting their teaching beliefs onto the teaching process, they not only exert a decisive influence on the extension of pertinent knowledge and behaviours among students but also lay the basis for each teacher's self-efficacy (Keating *et al.,* 2020; Oncu, 2019; Wilson *et al.,* 2018). Teacher self-efficacy has been described as a teacher's belief in their capability to organise and execute actions required to accomplish a specific teaching task in a particular context (Malinauskas, 2017). PE teachers with high self-efficacy believe they can achieve teaching functions (such as underpinning new knowledge and skills) in interactive teaching environments (Keating *et al.,* 2020; Woolfson *et al.,* 2018). However, Cuban (2016) discovered that teacher-centred learning environments have remained essentially unchanged over the last five decades, despite some teachers possessing teaching beliefs that cater to different learning needs. This lack of change indicates the persistent presence of traditional authoritarian teaching beliefs in the educational environment (Cuban, 1983; Cuban, 2016). Unlike traditional teaching beliefs, postmodernism stresses that knowledge comprises personal thoughts, creativity and life experiences (Cherryholmes, 1988; Doll, 1993; Peters *et al.,* 2018; Shih *et al.,* 2017; Shih *et al.,* 2019). Therefore, curriculum content should preferably be void of consensus and stability. Instead, it integrates the broader concepts of pluralism, innovation, criticism and reflection into teaching beliefs to overcome and liberate oneself from authoritarian educational contexts, thereby refining the substance of PE (Hill *et al.,* 2018; Peters *et al.,* 2018; Shih *et al.,* 2017; Shih *et al.,* 2019; Tong, 2020; Walton-Fisette & Sutherland, 2018; Wang & Liu, 2018).

Pluralism and innovation are the cornerstones of prevailing teaching beliefs and, importantly, combine multiple cultures to form the first stones of the postmodern PE setting (Cherryholmes, 1988; Doll, 1993; Peters *et al.,* 2018; Shih *et al.,* 2017). The theory of multiple intelligences (Gardner, 1983) emphasises that variations in the cultural and social environment translate into discrepancies between individuals' intellectual development; however, individuals tend to exploit such bits of intelligence in a subtly unique way to accomplish tasks or solve problems effectively (Al Ardha *et al.,* 2018; Bas, 2016; Castro-Sánchez & Sánchez-Zafra, 2019; Faidah *et al.,* 2019). Nevertheless, traditional PE views teachers as the authoritarian core of the classroom, with students simply serving as passive recipients and imitators of rigid and unchanging curriculum content whose multiple intelligences are stunted (Adams, 2020; Cuban, 1983; Cuban, 2016; Shih *et al.,* 2017; Shih *et al.,* 2019). In education, innovation refers to reform, selecting the most suitable materials (forms, methods, measures, concepts or

procedures), and creating teaching practices (Shih *et al.*, 2019). Therefore, teachers' beliefs should be freed from tradition and prioritise individual differences in cultural backgrounds, living environments, and mental and physical traits (O'Sullivan, 2020; Shih *et al.*, 2017; Shih *et al.*, 2019). Unleashing individuals'potential is another key focus of education (Gardner, 1983; Bas, 2016; Faidah *et al.*, 2019). Thus, curriculum content and assessment methods in PE should be innovated and reformed to integrate certain elements, such as multiculturalism and creativity, and to improve both students'motivation to learn and their athletic performance (Al Ardha *et al.*, 2018; Bas, 2016; Gardner, 1983; Tong, 2020; Shih *et al.*, 2017; Shih *et al.*, 2019; Wang & Liu, 2018).

Criticism involves questioning traditional or prevailing teaching beliefs from a fallacy viewpoint, reflecting on the underlying contradictions and eventually establishing a roadmap for reform (Braun & Potgieter, 2019; Cherryholmes, 1988; Hill *et al.*, 2018; Shih *et al.*, 2017; Shih *et al.*, 2019). Best and Kellner (1991) argue that all theories and values are temporary with the progression toward an era of pluralism. Therefore, teachers' beliefs regarding teaching should not be rigid. Instead, teachers should recognise themselves as the subject of their actions and thoughts through the process of criticism and make fair and just decisions (Braun & Potgieter, 2019; Cherryholmes, 1988; Doll, 1993; Hill *et al.*, 2018; Shih *et al.*, 2017; Shih *et al.*, 2019). For a PE teacher, critical thinking is defined by McBride (1991) as 'reflective thinking that is used to make reasonable and defensible decisions about movement tasks and challenges'(p. 115). Such thinking is represented through cognitive and social activities (e.g., group discussions) and externally through actions and decision-making (Lodewyk, 2009).

Postmodern education emphasises creativity, exceptional creativity and critical thinking, which can help teachers enrich and accumulate practical knowledge through critical reflection (Shih *et al.*, 2017). Critical reflection highlights teachers'internal thought processes when faced with real-world challenges before, during and after PE sessions (Shih *et al.*, 2017; Shih *et al.*, 2019). Through these processes, teachers reflect on their understanding and knowledge, how it is used in the teaching session and howit ultimately affects theirpractices (Cassidy *et al.*, 2004). From a postmodern perspective, knowledge is a rational human product. Individuals possess power, knowledge frees them from power, and learning occurs through critical reflection (Kilgore, 2001). Therefore, PE teachers should transform themselves into essential individuals of thought who frequently review the pros and cons of their teaching content, pedagogical approaches and assessment methods to create a path for the development of teaching beliefs (Hill *et al.*, 2018; Peters *et al.*, 2018; Shih *et al.*, 2017; Shih *et al.*, 2019; Walton-Fisette & Sutherland, 2018).

Teaching beliefs serve as guidelines for developing teaching content (Faidah *et al.*, 2019; Heuckmann *et al.*, 2018; Keating *et al.*, 2020; Shih *et al.*, 2017; Wilson *et al.*, 2018). However, teachers are often restricted by traditional teaching methods (such as unchangeable curricula) and settings (such as teacher-centred learning environments), which prevent them from fully expressing their teaching beliefs (Cuban, 1983; Cuban, 2016). PE at school begins students' understanding and learning about sports. If the traditional educational framework limits teachers' teaching beliefs, students can only succumb to forced learning, which is not conducive to developing multiple intelligences (Gardner, 1983). Just as postmodernism advocates the formation and development of new teaching beliefs, it is also necessary to break the shackles

of traditional thought and constantly acquire new knowledge to improve the impact of PE (Shih *et al.*, 2017). This is one of the leading development directions for physical education in Taipei City (Hsu, 2013). The present study drew on postmodernism (Cherryholmes, 1988; Doll, 1993) as its theoretical basis and applied rigorous exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) methods to measure the reliability and validity of the Teaching Beliefs Scale of Postmodern Physical Education (TBSPPE). The primary purpose of the TBSPPE was to demonstrate the concepts of pluralism, innovation, criticism, and reflection. The results will help evaluate the level of development of teachers'beliefs about teaching PE in the postmodern era.

METHODOLOGY

The TBSPPE adopted in this study was developed by Shih *et al.* (2017) through a literature review, focus group interviews, in-depth interviews, a modified Delphi method and an analytic hierarchy process. The relevant institutional review board reviewed and approved the study, and it has yet to undergo statistical analysis. The relationships between the observed (29 items) and latent (pluralism, reflection, criticism and innovation) variables have yet to be confirmed. EFA can elucidate how different items and constructs relate to each other and contribute to developing new theories. CFA confirms a previously stated theoretical model (Knekta *et al.*, 2019). Regarding the research methods proposed by Byrne (2001), Hair *et al.* (1998), Hair *et al.* (2010), Jöreskog and Sörbom (1996), Kim *et al.* (2011) and Noar (2003), the authors planned to conduct EFA on the accuracy and relevance of the scale items and then verify this through the competitive mode of CFA, as well as the recheck and validation stages (Figure 1).

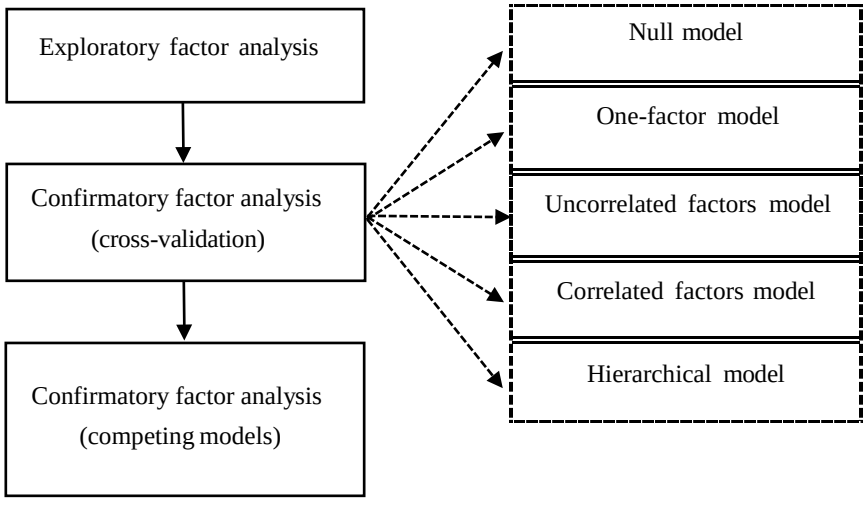

Figure 1. **RESEARCH FLOWCHART**

Exploratory factor analysis

In October 2019, PE teachers from elementary schools in Taipei were selected as the study population. Stratified random sampling was employed to distribute questionnaires across 12 administrative divisions (there were 12 administrative districts; each administrative district selected three schools and were sent five questionnaires, respectively), each with 15 questionnaires (ethical clearance number: FJU-IRB C105-035). A total of 180 questionnaires were distributed, of which 144 valid copies were retrieved and analysed using SPSS Statistics 20.0. Responses were scored on a five-point Likert scale, with 5 indicating 'strongly agree'and 1 showing 'strongly disagree'.

Confirmatory factor analysis (competing models)

In January 2020, using PE teachers in Taipei Elementary School (there were 12 administrative districts; each administrative district selected eight schools and sent five questionnaires), 40 questionnaires were distributed to 12 administrative regions by stratified random sampling for 480 questionnaires, of which 418 valid copies were retrieved. The questionnaires were randomised into two clusters of 209 responses. The first cluster was validated against competing models using IBM SPSS AMOS version 20.0. Jöreskog and Sörbom (1996) reported that different models could be compared, including null, one-factor, uncorrelated, correlated and hierarchical. Based on the fit indices of each model, the most parsimonious model was identified as the final one (Noar, 2003). The second cluster was validated in the subsequent cross-validation stage.

Confirmatory factor analysis (cross-validation)

Based on the scale's factor structure derived from competing models, the second cluster was subjected to another round of CFA to gauge the stability of the factor structure and its generalizability to an external sample. Cross-validation effectively determines whether a scale can be extrapolated to a broader sample (Kim *et al.*, 2011).

RESULTS

Exploratory factor analysis

A total of 29 items (items 1–7 on pluralism, 8–14 on reflection, 15–22 on criticism and 23–29 on innovation) were subjected to EFA. The sample consisted of 79 men (54.9%) and 65 women (45.1%) at the current stage. The items had to fulfil certain criteria, such as a critical ratio (CR) above 3.0 (Wolman, 1973) and a correlation coefficient above.30 between each item and the total score (Noar, 2003). Items 4, 17 and 21 were excluded because they failed to achieve the required CR values. Data were deemed suitable for factor analysis only when they achieved a Kaiser–Meyer–Olkin (KMO) value above.6 and a significant level in Bartlett's test of sphericity (Hair *et al.*, 2010). In the present study, a KMO value of .81 and a chi-squared value of 1491.06, as determined by Bartlett's test of sphericity, were considered significant. After rotation, items 5, 11, 20, 23 and 24 were eliminated because of cross-loading. Smith *et al.* (2003) noted that the incremental validity would be unfavourable if different factors were integrated into the same dimension for analysis. Eventually, 21 items were retained. Four constructs were extracted: innovation, reflection, pluralism and criticism. Their factor loadings had the following ranges: .60–.82, .57–.83, .64–.83 and .59–.80. The percentages of the explained variance were 17.75%, 16.30%, 16.22% and 15.19%, respectively, with a total

variance of 65.46%. A value of Cronbach's α of.70 and above was considered acceptable (Tavakol & Dennick, 2011). Cronbach's α values for internal consistency were .87, .87, .88 and .79, respectively, with an overall value of .92. Therefore, this scale had satisfactory reliability and validity (Table 1).

Table 1. **SUMMARY OF THE RESULTS OF EXPLORATORY FACTOR AND RELIABILITY ANALYSES**

Items	Constructs			
	INN	**REF**	**PLU**	**CRI**
1 I design PE curricula based on students' mental and physical traits.			.83	
2 I design various PE teaching materials to stimulate students' learning motivation.			.76	
3 I teach sports techniques from different perspectives to give students of various abilities a better grasp of movement education.			.79	
6 I balance learning goals from different aspects to promote balanced physical and mental development among students.			.66	
7 I assess students' learning outcomes using diverse assessment methods.			.64	
8 I constantly review the lesson plan throughout the PE teaching process.		.72		
9 I keep reflecting on the optimal solutions to problems throughout the PE teaching process.		.70		
10 I contemplate the teaching process and try to make changes for the better after teaching.		.57		
12 I think about the skills I should improve and seek ways of improving proactively.		.83		
13 I know my strengths as a PE teacher and can play to my strengths.		.68		
14 I think about the appropriateness of my pedagogical approaches through self-feedback and suggestions from others.		.60		
15 I think PE curricula should not be a low priority for resource allocation in the school.				.74
16 I think PE curricula should entail well-defined learning goals and content and not be seen as recreation oriented.				.76
18 I think PE should avoid gender role stereotypes.				.80
19 I think the prioritisation of PE should translate to actions beyond slogan shouting.				.70
22 I think sports competitions should prioritise character education and not take victory as the sole objective.				.59
25 I try innovative PE teaching behaviours to break the boundaries of traditional education.	.60			
26 I continue to pioneer novel pedagogical approaches in PE to improve students' willingness to learn and learning outcomes.	.82			
27 I participate in professional growth activities related to innovative PE to refine my professional literacy as a teacher.	.75			
28 I am keen on searching for information about innovative PE to enrich students' learning content.	.78			

29 I use innovative assessment methods to understand students' true skill performance.	.80			
Eigenvalue	3.73	3.42	3.41	3.19
Variance explained (%)	17.7	16.30	16.22	15.1
Cumulative variance explained (%)	5	34.04	50.23	9
Cronbach's α	17.7	.87	.88	65.4
	5			6
	.87			.79

INN=Innovation REF=Reflection PLU=Pluralism CRI=Criticism

Confirmatory factor analysis (competing models)

The sample comprised 119 men (56.9%) and 90 women (43.1%). Before performing CFA, the researcher checked whether the data met the requirements of the normality assumption in the process outlined below.

Normality test for observed variables

First, regarding the parameter estimates, the most widely used estimation model, the maximum likelihood method, was used to obtain the minimum difference between the observed and predicted covariant structures. Curran *et al.* (1996) reported that an absolute skewness coefficient below 2 and an absolute kurtosis coefficient below 7 are critical criteria for determining the normality of the data. In this study, each construct's skewness and kurtosis coefficients ranged from −.38 to −1.56 and from −.38 to 2.18, respectively. The corresponding threshold conditions were satisfied.

Second, regarding offending estimates, Hair *et al.* (1998) identify the following instances: i) the existence of negative error variance, ii) a standardised regression coefficient that is greater than or too close to 1 (with a threshold of .95); and iii) an excessive value of standard error (Byrne, 2001). The present study had positive error variances, a standardised regression coefficient ranging between .68 and .88, and a moderate standard error of .01–.05. All coefficients met the criteria for not having offending estimates.

Validation of competing models

Based on the four constructs extracted by EFA, we used competing CFA models to identify the most parsimonious constructs concerning the fit indices of TBSPPE. Bagozzi and Yi (1988) and Hair *et al.* (1998) recommended that considering the sample size, the χ^2/df ratio should be as low as possible. In contrast, the GFI and AGFI values should be as close to 1 as possible, and there is no absolute standard to judge the fit of models, with >.80 as the acceptable level. The RMSEA value must be lower than .08, whereas the NFI, TLI and CFI must exceed .90, and the PCFI, PNFI and PGFI must exceed the acceptable level of .50 (Byrne, 2001; Hair *et al.*, 1998). As shown in Table 2, the fit indices of the null, one-factor, and uncorrelated factor models were inferior to those of the correlated and hierarchical models, which shared near-identical acceptable levels and belonged to the equivalent models, indicating that the two models achieved statistical validity. The TBSPPE design was initially intended to conceptualise constructs based on a hierarchy. Therefore, we tested a hierarchical model comprising four constructs in the internal model structure.

Table 2. **SUMMARY OF MODEL FIT INDICES FOR COMPETING MODELS**

Fit index		AL	NM	OFM	UFM	CFM	HM
		As low as possible	3150.05	1806.91	507.93	377.78	383.56
AF	GFI	>.80	-	.44	.82	.86	.86
	RMSEA	<.08	-	.10	.09	.07	.07
	AGFI	>.80	-	.31	.77	.82	.82
IF	NFI	>.90	-	.43	.86	.90	.90
	TLI	>.90	-	.39	.88	.92	.92
	CFI	>.90	-	.45	.89	.93	.93
PF	PCFI	>.50	-	.41	.80	.81	.82
	PNFI	>.50	-	.38	.76	.77	.77
	PGFI	>.50	-	.36	.67	.68	.69
	χ^2 / df	<3	15.00	9.56	2.69	2.06	2.07

χ^2=Chi-square AF=Absolute Fit IF=Incremental Fit PF=Parsimony Fit GFI=Goodness-of-Fit Index RMSEA=Root Mean Square Error Of Approximation AGFI=Adjusted Goodness-of-Fit Index NFI=Normed Fit Index TLI=Tucker-Lewis Index CFI=Comparative Fit Index PCFI=Parsimonious Comparative Fit Index PNFI=Parsimonious Normed Fit Index PGFI = Parsimonious Goodness-of-Fit Index AL=Acceptable Level NM=Null Model OFM=One-Factor Model UFM=Uncorrelated Factors Model CFM=Correlated Factors Model HM=Hierarchical Model

Test of internal model structure

A reliability test should yield composite reliability above.60 and average variance extracted (AVE) above.50 (Bagozzi & Yi, 1988). Factor loadings must also exceed, as a measure of convergent validity, and exceed.45 (Jöreskog & Sörbom, 1989). Convergent validity was considered satisfactory if all three criteria were satisfied. Meanwhile, variables were deemed adequate discriminant validity if the 95% confidence interval of the correlation coefficients between variables excluded 1 (Jöreskog & Sörbom, 1989). This study yielded composite reliability values of .88–.93, AVE values of .59–.68 and factor loadings of .68–.88, whereas the 95% confidence interval of the bootstrapped correlation coefficients did not contain 1. All the statistical data met the above criteria, indicating satisfactory reliability, convergent validity and discriminant validity.

Confirmatory factor analysis (cross-validation)

The study sample comprised 128 men (61.2%) and 81 women (38.8%). The skewness coefficient, kurtosis coefficient, standardised regression coefficient and standard error of each dimension are in the ranges of −.25 to −1.67, −.67 to 2.48, .70 to .90, and .02 to .04 without any excessively large numbers, and meet the relevant conditions and specifications. After cross-validation (Table 3), the measures of fit of the correlated factors and hierarchical models with the same research results as in the previous stage were optimised, further confirming that the TBSPPE had a hierarchical factor model. The internal model structure demonstrated factor loadings of .70–.90, composite reliability values of .89–.94 and AVE values of .62–.74, whereas the 95% confidence interval of the bootstrapped correlation coefficients excluded 1. All deals were in line with the specifications. The hierarchical model retained good reliability as well as convergent and discriminant validity.

Table 3. **SUMMARY OF MODEL FIT INDICES IN CROSS-VALIDATION**

Fit index		AL	CFM	HM
		As low as possible	355.68	359.96
AF	GFI	>.80	.87	.87
	RMSEA	<.08	.07	.07
	AGFI	>.80	.83	.83
	NFI	>.90	.90	.90
IF	TLI	>.90	.94	.94
	CFI	>.90	.95	.95
	PCFI	>.50	.83	.83
PF	PNFI	>.50	.78	.79
	PGFI	>.50	.69	.69
	χ^2 / df	<3	1.94	1.95

χ^2=Chi-square AF=Absolute Fit IF=Incremental Fit PF=Parsimony Fit GFI=Goodness-of-Fit Index RMSEA=Root Mean Square Error of Approximation AGFI=Adjusted Goodness-of-Fit Index NFI=Normed Fit Index TLI=Tucker-Lewis Index CFI=Comparative Fit Index PCFI=Parsimonious Comparative Fit Index PNFI=Parsimonious Normed Fit Index PGFI=Parsimonious Goodness-of-Fit Index AL=Acceptable Level CFM=Correlated Factors Model HM=Hierarchical Model

DISCUSSION AND CONCLUSION

The TBSPPE proposed in this study demonstrated satisfactory reliability and validity. In the context of postmodern concepts, the hierarchical model and the four-factor design were both fitting and effective in gauging the level of development of teaching beliefs to ensure improvement in teaching efficacy.

Regarding practical implications, pluralism and innovation offer a new roadmap for developing teaching beliefs while highlighting the teacher's role as the executor of education and the cultivator of students'potential (Bas, 2016; Faidah et al., 2019; Gardner, 1983). Therefore, the way in which teachers should guide and stimulate their motivation and interest in learning has become the key to inspiring multiple intelligences (Al Ardha et al., 2018; Faidah *et al.*, 2019; Gardner, 1983; Wang & Liu, 2018). In light of this, the innovative concept of the TBSPPE implies that postmodern PE should overcome the limits of unified and standardised curriculum content. Curriculum content and assessment methods most suited to multiple intelligence traits, and learning interests specific to each student should be developed to satisfy the learning needs of different students (Al Ardha *et al.*, 2018; Bas, 2016; O'Sullivan, 2020; Shih *et al.*, 2017; Wang & Liu, 2018). Moreover, as teachers have long been confined to the traditional demonstrate-and-repeat mentality of teaching, they have lost the ability to determine the validity and value of their internal beliefs from an objective perspective (Cherryholmes, 1988; Cuban, 1983; Cuban, 2016; Doll, 1993; Shih *et al.*, 2017). Therefore, the concepts of criticism and reflection in the TBSPPE are informed by self-reflective qualities. Through conscious reflection, teachers can offer an objective lens to determine and evaluate the practical value of their teaching beliefs.

Amid innovation in teaching content and the diversification of assessment methods in PE, developmental trends in teaching beliefs are often inseparable from teachers' roles, teaching behaviours and attitudes. Applying the essence of such beliefs to the teaching process can

enhance students'learning outcomes (Heuckmann *et al.,* 2018; Keating *et al.,* 2020; Shih *et al.,* 2017). The TBSPPE integrates the four fundamental concepts of postmodern PE and views PE as a knowledge-creation process. During this process, teachers must cultivate knowledge and skills and, through criticism and intellectual activities (such as critical reflection), constantly adapt their teaching beliefs to students' multiple intelligences and adaptations across teaching scenarios. These developments in teaching beliefs will lay the groundwork for subsequent innovations in lesson plans and curriculum content, thereby enriching the substance of postmodern PE. The TBSPPE is characterised by pluralistic ideation, innovation, value clarification and inner reflection. Therefore, applying the scale to various pedagogical models, such as the teaching game for understanding (Bunker & Thorpe, 1982) and the spectrum of teaching styles (Mosston, 1992), can enrich the breadth and depth of discussion. Finally, this study primarily targeted elementary school PE teachers. Future studies may extend the scope to include teachers at junior and senior high schools and higher education institutions to improve the generalisability of the TBSPPE.

CONFLICT OF INTEREST

No conflict of interest declared

REFERENCES

ADAMS, B.E. (2020). Decentralization and policy experimentation in education: the consequences of enhancing local autonomy in California. *The Journal of Federalism*, 50(1): 30–54. Hyperlink: [http://doi.org/10.1093/publius/pjz006].

AL ARDHA, M.A.; YANG, C.B.; ADHE, K.R.; KHORY, F.D.; HARTOTO, S. & PUTRA, K.P. (2018). Multiple intelligences and physical education curriculum: application and reflection of every education level in Indonesia. *Advances in Social Science, Education and Humanities Research,* 212: 587–592. Hyperlink: [https://doi.org/10.2991/icei18.2018.129].

BAHCIVAN, E. & COBERN, W.W. (2016). Investigating coherence among Turkish elementary science teachers' teaching belief systems, pedagogical content knowledge, and practice. *Australian Journal of Teacher Education,* 41 (10): 63–86. Hyperlink: [https://doi.org/10.14221/ajte.2016v41n10.5].

BAGOZZI, R.P. & YI, Y. (1988). On the evaluation for structural equation models. *Journal of the Academy of Marketing Science,* 16 (1): 74–94. Hyperlink: [https://doi.org/10.1177/009207038801600107].

BAS, G. (2016). The effect of multiple intelligences theory-based education on academic achievement: a meta-analytic review. *Educational Sciences: Theory and Practice,* 16(6): 1833–1864. Hyperlink: [https://doi.org/10.12738/estp.2016.6.0015].

BEST, S. & KELLNER, D. (1991). *Postmodern theory: Critical interrogations.* New York, NY: Guilford Press.

BRAUN, G.J. & POTGIETER, F.J. (2019). A confessional and narrative vision for philosophy of education: justification and basic presuppositions of a postmodern approach. *Christian Higher Education,* 18(4): 276–293. Hyperlink: [https://doi.org/10.1080/15363759.20 18.1521755].

BUNKER, D. & THORPE, R. (1986). The curriculum model. In R. Thorpe, D. Bunker, & L. Almond (Eds.), *Rethinking games teaching* (pp. 7–10). Loughborough, UK: University of Technology.

BYRNE, B.M. (2001). *Structural equation modeling with Amos: Basic concepts, applications, and programming.* New Jersey: Lawrence Erlbaum Associates.

CASSIDY, T.; JONES, R. & POTRAC, P. (2004). *Understanding sports coaching.* New York: Routledge.

CASTRO-SÁNCHEZ, M. & SÁNCHEZ-ZAFRA, M. (2019). Addressing multiple intelligences from the subject of physical education. *ESHPA-Education, Sport, Health and Physical Activity*, 3(2): 235–247. Hyperlink: [http://hdl.handle.net/10481/56423].

CHERRYHOLMES, C.H. (1988). *Power and criticism: poststructural investigations in education.* New York, NY: Teachers College Press.

CONTI, G.J. (1989). Assessing teaching style in continuing education. *New Directions for Continuing Education*, 43: 3–16. Hyperlink: [https://doi.org/10.1002/ace.36719894303].

CUBAN, L. (1983). How did teachers teach, 1890-1980. *Theory into Practice*, 22(3): 159–165. Hyperlink: [https://doi.org/10.1080/00405848309543056].

CUBAN, L. (2016). *Teaching history then and now: A story of stability and change.* Cambridge, MA: Harvard Education Press.

CURRAN, P.J.; WEST, S.G. & FINCH, J.F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*, 1(1): 16–29. Hyperlink: [https://doi.org/10.1037/1082-989x.1.1.16].

DICK, W. (1997). Better Instructional design theory: process improvement or reengineering. *Educational Technology*, 37(5): 47–50.

DOLL, W.E. Jr. (1993). *A postmodern perspective on curriculum.* New York, NY: Teachers College Press.

FAIDAH, R.T.; FAUZIATI, E. & SUPARNO, S. (2019). Exploring the influencing factors of teachers' beliefs toward the use of multiple intelligences-based English teaching. *Advances in Social Sciences Research Journal*, 6(6): 137–150. Hyperlink: [https://doi.org/10.14738/assrj.66.6653].

GARDNER, H. (1983). *Frames of Mind: The theory of multiple intelligences.* NY: Basic Books.

HADI, M. (2020). Exploring the teaching and learning beliefs of an Indonesian English teacher. *JOLLT Journal of Languages and Language Teaching*, 8(1): 29–39. Hyperlink: [https://doi.org/10.33394/jollt.v8i1.2222].

HAIR, F. Jr.; ANDERSON, R.E.; TATHAM, R.L. & BLACK, W.C. (1998). *Multivariate and data analysis with reading.* New York: Maxwell MacMillan International.

HAIR, F. Jr.; BLACK, W.C.; BABIN, B.J. & ANDERSON, R.E. (2010). *Multivariate Data Analysis: A Global Perspective* (7th ed.). New York, NY: MacMillan.

HEUCKMANN, B.; HAMMANN, M. & ASSHOFF, R. (2018). Using the theory of planned behaviour to develop a questionnaire on teachers' beliefs about teaching cancer education. *Teaching and Teacher Education*, 75: 128–140. Hyperlink: [https://doi.org/10.1016/j.tate.2018.06.006].

HILL, J.; PHILPOT, R.; WALTON-FISETTE, J.L.; SUTHERLAND, S.; LEMONS, M.; OVENS, A.; PHILLIPS, S. & FLORY, S. (2018). Conceptualizing social justice and sociocultural issues within physical education teacher education: international perspectives. *Physical Education and Sport Pedagogy*, 23(5): 469–483. Hyperlink: [https://doi.org/10.1080/17408989.2018.1470613].

HSU, S.H.T. (2013). The role of physical education in Taiwan. Global Perspectives on Physical Education & After-School Sport Programs, 131149.

JÖRESKOG, K.G. & SÖRBOM, D. (1989). LISREL 7*: A guide to the program and applications* (2nd ed.). Chicago, IL: SPSS.

JÖRESKOG, K.G. & SÖRBOM, D. (1996). *LISREL 8 user's reference guide.* Mooresville, IN: Scientific Software.

KEATING, X. D.; LIU, J., LIU, X.; COLBURN, J.; GUAN, J. & ZHOU, K. (2020). An analysis of Chinese preservice physical education teachers' beliefs about the physical education profession. *Journal of Teaching in Physical Education*, 40(1): 58–65. Hyperlink: [https://doi.org/10.1123/jtpe.2019-0095].

KILGORE, D.W. (2001). Critical and postmodern perspectives on adult learning. *New Directions for Adult and Continuing Education,* 89: 53–61. Hyperlink: [https://doi.org/10.1002/ace.8].

KIM, Y.K.; TRAIL, G.T.; WOO, B. & ZHANG, J. (2011). Sport consumer-team relationship quality: development and psychometric evaluation of a scale. *International Journal of Sports Marketing and Sponsorship, 12*(3): 254–271. Hyperlink: [https://doi.org/10.1108/IJSMS-12-03-2011-B006].

KNEKTA, E.; RUNYON, C. & EDDY, S. (2019). One size doesn't fit all: using factor analysis to gather validity evidence when using surveys in your research. *CBE—Life Sciences Education,* 18(1): 1–17. Hyperlink: [https://doi.org/10.1187/cbe.18-04-0064].

LAMB, P.; LANE, K.; & ALDOUS, D. (2013). Enhancing the spaces of reflection: a buddy peer-review process within physical education initial teacher education. *European Physical Education Review,* 19(1): 21–38. Hyperlink: [https://doi.org/10.1177/1356336X12457293].

LODEWYK, K.R. (2009). Fostering critical thinking in physical education students. *Journal of Physical Education, Recreation & Dance,* 80(8): 12–18. Hyperlink: [https://doi.org/10.1080/07303084.2009.10598368].

MALINAUSKAS, R.K. (2017). Enhancing of self-efficacy in teacher education students. *European Journal of Contemporary Education,* 6(4): 732–738. Hyperlink: [https://doi.org/10.13187/ejced.2017.4.732].

MCBRIDE, R.E. (1991). Critical thinking: an overview with implications for physical education. *Journal of Teaching in Physical Education,* 11(2): 112–125. Hyperlink: [https://doi.org/10.1123/jtpe.11.2.112].

MOSSTON, M. (1992). Tug-O-War, No more: Meeting teaching-learning objectives using the spectrum of teaching styles. *Journal of Physical Education, Recreation and Dance,* 63(1): 27–56. Hyperlink: [https://doi.org/10.1080/07303084.1992.10604083].

MOSELEY, C.; UTLEY, J.; ANGLE, J. & MWAVITA, M. (2016). Development of the environmental education teaching efficacy belief instrument. *School Science and Mathematics,* 116(7): 389–398. Hyperlink: [https://doi.org/10.1111/ssm.12189].

MUHTAROM, M.; JUNIATI, D. & SISWONO, T.Y.E. (2019). Examining prospective teacher beliefs and pedagogical content knowledge towards teaching practice in mathematics class: a case study. *Journal on Mathematics Education,* 10(2): 185–202. Hyperlink: [https://doi.org/10.22342/jme.10.2.7326.185-202].

NOAR, S.M. (2003). The role of structural equation modeling in scale development. *Structural Equation Modeling,* 10(4): 622–647. Hyperlink: [https://doi.org/10.1207/S15328007SEM1004_8].

ONCU, E. (2019). Anexamination of Turkish physical education teachers' interpersonal self-efficacy beliefs. *Physical Education of Students,* 23 (1): 37–44. Hyperlink: [https://doi.org/10.15561/20755279.2019.0106].

O'SULLIVAN, M. (2020). Global challenges and opportunities for physical education teacher educators. Research *Quarterly for Exercise and Sport,* 92(3): 327–338. Hyperlink: [https://doi.org/10.1080/02701367.2020.1730295].

PETERS, M.A.; TESAR, M. & JACKSON, L. (2018). After postmodernism in educational theory? A collective writing experiment and thought survey. *Educational Philosophy and Theory,* 50(14): 1299–1307. Hyperlink: [https://doi.org/10.1080/00131857.2018.1457868].

RANDALL, L. & ROBINSON, D.B. (2016). An Introduction. In D.B. Robinson and L. Randall (eds.) *Social Justice in Physical Education: Critical Reflections and Pedagogies for Change* (pp. 7–10). Toronto: Canadian Scholars' Press.

SHIH, W.Y.; PU, Y.L.; HUANG, P.R.; CHOU, H.S. & PAN, Y.H. (2017). The construction and weight analysis of physical education teachers' belief indices in postmodern thought. *Physical Education Journal*, 50(2): 219–232. [in Chinese]

SHIH, W.Y.; PU, Y.L. & HO, T.K. (2019). Construction of a learning scale for postmodern physical education lessons. *South African Journal for Research in Sport, Physical Education and Recreation Social Sciences*, 41(3): 87–99. Hyperlink: [https://hdl.handle.net/10520/EJC-19ebe4c3f0].

SMITH, G.T.; FISCHER, S. & FISTER, S.M. (2003). Incremental validity principles in test construction. *Psychological Assessment*, 15(4): 467–477. Hyperlink: [https://doi.org/10.1037/1040-3590.15.4.467].

TAVAKOL, M. & DENNICK, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 27(2): 53–55. Hyperlink: [https://doi.10.5116/ijme.4dfb.8dfd].

TONG, S. (2020). An evaluation model of the learning effect of physical education major courses in colleges. *International Journal of Emerging Technologies in Learning*, 15(7): 17–28. Hyperlink: [https://doi.org/10.3991/ijet.v15i07.13691].

WALTON-FISETTE, J.L. & SUTHERLAND, S. (2018). Moving forward with social justice education in physical education teacher education. *Physical Education and Sport Pedagogy*, 23(5): 461–468. Hyperlink: [https://doi.org/10.1080/17408989.2018.1476476].

WANG, X. & LIU, Y.L. (2018). Cooperative learning method in physical education teaching based on multiple intelligence theory. *Educational Sciences: Theory and Practice*, *18*(5): 2176–2186. Hyperlink: [http://dx.doi.org/10.12738/estp.2018.5.117].

WILSON, C.; WOOLFSON, L.M. & DURKIN, K. (2018). School environment and mastery experience as predictors of teachers' self-efficacy beliefs towards inclusive teaching. *International Journal of Inclusive Education*, 24(2): 218–234. Hyperlink: [https://doi.org/10.1080/13603116.2018.1455901].

WOLMAN, B.B. (1973). *Dictionary of behavioral sciences.* New York, NY: Van Nostrand Reinhold.

Corresponding author: *Tu-Kuang Ho*; **Email:** *3025567020@qq.com*