

The Development and Examination of a Teaching Commitment Scale for Elementary School Health and Physical Education Teachers

Yi-Hsiang Pan, Wei-Ting Hsu, and Chang-Pang Lin

Abstract—The purpose of this study was to develop and examine a Teaching Commitment Scale of Health and Physical Education (TCS-HPE) for Taiwanese elementary school teachers. First of all, based on teaching commitment related theory and literatures to develop a original scale with 40 items, later both stratified random sampling and cluster sampling were used to sample participants. During the first stage, 300 teachers were sampled and 251 valid scales (83.7%) returned. Later, the data was analyzed by exploratory factor analysis to obtain 74.30% of total variance for the construct validity. The Cronbach's alpha coefficient of sum scale reliability was 0.94, and subscale coefficients were between 0.80 and 0.96. In the second stage, 400 teachers were sampled and 318 valid scales (79.5%) returned. Finally, this study used confirmatory factor analysis to test validity and reliability of TCS-HPE. The result showed that the fit indexes reached acceptable criteria ($\chi^2_{(246)} = 557.64$, $p < .05$, RMSEA = 0.03, GFI = 0.96, AGFI = 0.95, NFI = 0.91, CFI = 0.98, RMR = 0.04, SRMR = 0.03). In conclusion, TCS-HPE has four dimensions with 24 items, including teaching identification, teaching involvement, teaching objectives and tendency towards work continuation. It is an acceptable measurement instrument with reliability and validity.

Keywords—Attitude, belief, construct validity, teachers' professional development.

I. INTRODUCTION

COMMITMENT can affect human behavior [1]. Commitment means pledge, promise and duty regarded as a solemn responsibility [2]. Teachers' commitment is a kind of beliefs, which affect teachers' professional practice. Teachers' commitment is a crucial indicator of teacher professionalization [3]. Teachers' commitment also played a key influencing role in teachers' professional identify [4]. On the other hand, teacher commitment has been found that it could influence teachers' work performance, retention, burnout and turnover, and it could also influence on students' motivation, achievement, attitudes towards learning [5]. Therefore, some researchers have recently focused on the issues of teachers' commitment [6]–[8].

Previous researchers found that teachers' commitment is important factor related to teachers' professional behavior. For example, Jennett, Harris and Mesibov's study found that teachers' commitment had significant relationship with burnout, teachers' with higher commitment had lower burnout level [6]. Sharif, Kanik, Omar, and Sulaiman also explored the relationship between teachers' empowerment and the

organizational commitment of teachers' in rural secondary school, whose finding demonstrated that there was a positive significant correlation between teachers' empowerment and teachers' organizational commitment ($r = .467$) [8]. According to Rosenholt's study, teacher commitment was related to students' academic achievement, teachers' commitment could explain 59% of the variance for reading achievement, teachers' commitment could explain 65% of the variance for math achievement [9]. Other researchers also explored which factors influence teachers' commitment, for example, Ware and Kitsantas examined relationships among measures of teacher commitment and teacher and principal efficacy beliefs. They found that principals' efficacy impacted teacher commitment directly or indirectly through teacher efficacy to enlist administrator support or through teachers' collective efficacy belief [10]. Moreover, Jones and Youngs also conducted a study examining daily emotions and their association with the commitment and burnout of beginning teachers, the results indicated that mean levels of positive affect and skill were positively associated with commitment, even when controlling for prior commitment [7]. Based above findings of researches, teacher commitment influence on teachers' behavior and teaching performance, it also influence on students' learning performance.

Since 2001, physical education and health has been integrated into the same learning field, it is a new learning field in Taiwan elementary school. In health and physical education learning field, teaching commitment is also an important factor that influences teaching praxis. In present study, we explored teaching commitment health and physical education teachers. We used teaching commitment as teachers' commitment of health and physical education. If we want to understand teaching commitment of health and physical education, it is essential to develop a measurement in order to assess teaching commitment for health and physical education teachers in Taiwan.

Previous researchers have explored factor constructs of teaching commitment, for example, Day, Elliot, and Kington indicated that commitment may be better understood as a nested phenomena at the centre of which is as set of core, relatively permanent values based upon personal beliefs, images of self, role and identify [5]. Kushman proposed two forms of teachers' commitment, including organizational commitment and commitment to student learning [11]. Organizational commitment meant what an individual internalizes organizational values and goals and feels a sense of loyalty to the work place; commitment to student learning as involving

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three factor, including teacher efficacy, expectations for student success, and the willingness to put forth effort required for student learning taking place in the classroom. Firestone and Pennell indicated that teaching commitment has multidimensional factor constructs [11], and some researchers who investigated teaching commitment have constructed different dimensions based on various topics or subjects. Tyree showed that teaching commitment has two dimensions, including teaching identification and teaching objectives [13]. Composto specified that teaching commitment has three dimensions: teaching identification, teaching involvement and tendency towards work continuation [14]. Grady presented that teaching commitment includes teaching objectives, teaching involvement and tendency towards work continuation [15]. Riley, Smith and Forgione concluded that teaching commitment consists of professional identification, effort towards work and tendency towards work continuation [3]. Chen indicated that teaching commitment includes teaching objectives, interaction between teachers and students, teaching plan and efforts towards teaching [16]. Based on the above mentioned studies, these researchers have discovered that teaching commitment contains mainly four dimensions: teaching identification, teaching involvement, teaching objectives and tendency towards work continuation [13], [15]-[17].

Based on above literacy reviewing, teaching commitment contains four dimensions that include teaching identification, teaching involvement, teaching objectives and tendency towards work continuation. This study used both exploratory and confirmatory factor analyses to construct a teaching commitment scale for health and physical education teachers in Taiwanese elementary schools.

II. METHODOLOGY

A. Participants

The participants were elementary school health and physical education teachers in Taiwan. Both stratified random sampling and cluster sampling were used. In the first stage, 300 teachers were sampled and 251 valid scales (83.7%) returned. These were later used in exploratory factor analysis to test the validity of construction. During the second stage, 400 teachers were sampled and 318 valid scales (79.5%) returned. These were later used in confirmatory factor analysis to test validity and reliability.

B. Measurement Instrument

This scale has four dimensions including teaching identification, teaching involvement, teaching objectives, and tendency towards work continuation. Teaching identification means that a teacher regards health and physical education curriculum as an important subject in school. Teaching involvement refers to how much time and effort a teacher wants to put into practical teaching. Teaching objectives means whether a teacher is willing to try his/her best to guide pupils. Tendency towards work continuation indicates how much a teacher wants to remain working in health and physical education field in the future. A Likert 6 point scale was adapted in TCS-HPE.

C. Procedure of Research

In the present study, it involved 6 procedures as follows: 1. Analyzing related theory and literature. 2. Researching and collecting information of practical teaching activity in health and physical education. 3. Make an open-ended questionnaire and consult experts for this questionnaire. 4. Construct an original scale with 40 statements. 5. Use the exploration factor analysis in the first stage and the confirmatory factor analysis in the second to test construct validity. 6. Complete the formal scale.

D. Data Analysis

This study used the following statistical methods:

1. Descriptive statistics: mean, standard deviation and percentage were used to analyze the various dimensions of the scale.

2. Validity analysis of the scale: item analysis, consistency reliability, exploratory factor analysis and confirmatory factor analysis were used. For confirmatory factor analysis, the statistic software LISREL was used to analyze the construct validity of the scale. The fit indexes in linear structural equation such as χ^2 , RMSEA, GFI, AGFI, CFI, NFI, RMR, SRMR were used to confirm the validity of the scale.

3. The parametric statistical tests level of this study was $\alpha = .05$.

III. RESULTS

A. Validity and Reliability of TCS-HPE in the First Stage

Item analysis: 300 teachers were sampled in the first stage and 251 valid scales (83.7%) returned. The original scale included 40 statements. In item analysis critical ratio (CR), all statements reached significant levels. These CRs were between 6.63 and 11.08. On the other hand, all correlation coefficient-related sum scales were also significant, and these correlation coefficients were between 0.48 and 0.74.

1. *Exploratory factor analysis*: Exploratory factor analysis was used to test the validity of scale. Principal component analysis and the indirect oblimin method were used to obtain four components. Some statements with factor-loading absolute values less than 0.40 or statements with factor-loading across two dimensions up to 0.35 were eliminated. Finally, the scale contained 24 statements, with 6 statements in teaching identification, 5 in teaching involvement, 7 in teaching objectives and 6 in tendency towards work retained. Later, this study used exploratory factor analysis again, and all statements were contained in the expected component. The results showed that the total variance explained reached 74.30% as in Table I.

2. *Reliability*: As shown in Table II, the Cronbach's alpha coefficient of sum scale reliability was 0.94, with subscales between 0.80 and 0.96.

TABLE I
ABSTRACT OF EXPLORATORY FACTOR ANALYSIS

Number of Statements	TOB	TTWC	TID	TIN	Community
16	.90				.83
18	.90				.82
14	.89				.81
13	.89				.81
15	.87				.76
12	.87				.78
17	.86				.77
22		.94			.89
23		.93			.87
24		.93			.86
21		.92			.85
20		.88			.77
19		.87			.75
5			.86		.74
4			.85		.73
6			.82		.68
2			.77		.66
3			.76		.66
1			.72		.60
8				.87	.77
9				.82	.69
11				.80	.67
7				.63	.47
10				.60	.60
Eigenvalue	10.46	4.23	1.70	1.44	
Explained Variance	43.59%	17.26%	7.08%	6.00%	
Accumulated variance	43.59%	61.21%	68.29%	74.30%	

Note:

TOB means teaching objectives

TTWC means teaching towards word continuation

TID means teaching identification

TIN means teaching involvement

Statements for TCS-HPE

- In health and physical education (HPE) curriculum, students can improve concepts on health and sports knowledge.
- It is essential to implement HPE curriculum in school.
- HPE curriculum can promote students' mental health, for example: self-understanding, emotional management and social relationship.
- Pupils can release pressure and eliminate depression from physical education in teaching of HPE curriculum.
- HPE curriculum can improve pupils' sports skill and interests in leisure activities.
- HPE curriculum can improve pupils' personal hygiene and habits.
- I do my best to participate in curriculum development projects and other teaching related discussions in HPE curriculum.
- I am not willing to spend extra time to prepare teaching materials and teaching resources to improve student learning.
- I am not willing to implement a great diversity of teaching methods.
- I do my best to perform correct demonstrations for my pupils.
- I am not willing to spend extra time to help pupils who do not have good coordination or have difficulty in learning.
- I want to do my best to help students form good hygiene and habits.
- I want to do my best to educate students to maintain a healthy attitude and behavior.
- I want to do my best to help students learn more about concepts on health and sports.
- I want to do my best to improve students' health-related physical fitness.
- I want to do my best to develop pupils' ability of running, jumping, and throwing in field in order to reach teaching objectives.
- I want to do my best to develop pupils' agility of basic gymnastics in order to reach teaching objectives.
- I want to do my best to improve pupils' agility of ball games in order to reach teaching objectives.

- It is a high expectation to continue my work in PHE curriculum.
- I want to be an HPE teacher because it is full of challenge.
- I want to be an HPE teacher because I am a professional in this curriculum.
- I want to be an HPE teacher whether there are enough equipments and facilities or not.
- I want to be an HPE teacher even HPE curriculum is not considered important in my school.
- I still want to be an HPE teacher even if these classes are being held outdoors under all sorts of unfavorable weather conditions.

TABLE II
SUMMARY OF RELIABILITY OF TEACHING COMMITMENT SCALE IN THE FIRST STAGE

TOB	TTWC	TID	TIN	Sum scale
.90	.83	.80	.96	.94

B. Validity and Reliability of TCS-HPE in the Second Stage

1. Validity of confirmatory factor analysis

This second stage used a scale constructed with 24 statements from the exploratory factor analysis. Based on a final scale as Table III, This stage sampled 400 teachers and 318 valid scales were returned. The skewness (-0.33~1.19) and kurtosis (-0.48~1.01) of scale parameters are the acceptable range of ± 1.96 . Table IV is observed variables of correlation matrix. As indicated by Table V, t value of all parameters reached significant level. The result showed that the fit index could be accepted [$\chi^2_{(246)} = 557.64$, $p < .05$, RMSEA = 0.03, GFI = 0.96, AGFI = 0.95, NFI = 0.91, CFI = 0.98, RMR = 0.04, SRMR = 0.03]. As for the suitability of the whole model ($\chi^2_{(246)} = 557.64$, $p < 0.05$) did not meet the validity standard, but other fit indexes showed that the data adequately fit the hypothetical model (see Table V). The observation index RMSEA=0.03 was lower than 0.10; GFI=0.96 was greater than 0.90; AGFI=0.95 was greater than 0.90; NFI=0.91 was greater than 0.90; CFI=0.98 was greater than 0.90; RMR=0.04 was lower than 0.10; SRMR=0.03 was lower than 0.10; According to fig.1, it indicated that the factor loadings for all individual items were between 0.72 and 0.92. All factor loadings were statistically significant for hypothetical model. Summary, the results of this study showed that fit indexes of TCS-HPE reached the acceptable criteria, indicating that this pattern of evaluation was acceptable and in accordance with the verifying data, which means that this scale is valid. Therefore, this scale has construct validity and four stable components: teaching identification, teaching involvement, teaching objectives and tendency towards work continuation.

2. Convergent Validity

According to Table VI, items reliability showed that teaching identification were 0.68, 0.84, 0.69, 0.58, 0.68, 0.72, Teaching involvement were 0.52, 0.64, 0.66, 0.57, 0.73. teaching objectives were 0.63, 0.79, 0.74, 0.53, 0.68, 0.71, 0.55, Tendency towards work continuation were 0.65, 0.77, 0.75, 0.71, 0.53, 0.62. On the other hand, Composite reliability (CR) were 0.93, 0.89, 0.93, 0.92. The Average variance extracted (AVE) were 0.70, 0.62, 0.66, 0.67. Convergent validity could be examine using average variance extracted and construct reliability. In this study, CR is more than 0.70, AVE is more than 0.50, which is acceptable according to Jöreskog and Sörbom [18].

3. Discriminant Validity

Jöreskog and Sörbom indicated that confidence interval of correlation coefficient could be used to test discriminant validity [18]. If the confidence interval could not contain 1.00, it revealed that the two dimensions were different dimension. The confidence interval formula of correlation coefficient is $r \pm 1.96 \times \text{standard error}$. The confidence interval of correlation coefficient of each parameters did not contain 1.00 as Table VII, it showed that TCS-HPE had an acceptable discriminant validity.

TABLE III
ABSTRACT OF MEAN, SKEWNESS AND KURTOSIS

statements	M	SD	Skewness	Kurtosis
1	5.03	0.70	-0.38	0.12
2	5.24	0.72	-0.60	-0.19
3	5.09	0.73	-0.33	-0.48
4	5.16	0.84	-1.38	0.77
5	5.14	0.79	-1.19	0.73
6	5.05	0.77	-0.95	0.45
7	4.91	0.79	-0.80	0.81
8	4.83	0.95	-0.58	0.28
9	4.84	1.01	-0.93	0.99
10	5.01	0.72	-0.73	0.85
11	4.90	0.91	-0.57	-0.05
12	5.34	0.68	-0.79	0.43
13	5.36	0.67	-0.76	0.30
14	5.33	0.67	-0.69	0.20
15	5.23	0.70	-0.73	1.01
16	5.16	0.70	-0.46	-0.10
17	5.06	0.76	-0.83	1.35
18	5.19	0.70	-0.68	0.99
19	4.16	1.11	-0.45	-0.01
20	4.22	1.07	-0.47	0.06
21	4.13	1.15	-0.46	-0.17
22	4.13	1.18	-0.37	-0.44
23	4.20	1.16	-0.54	-0.06
24	4.14	1.19	-0.53	-0.09

4. Reliability Test

Twenty-two individual item reliability (r^2) of observable variables from 0.52 to 0.79 which were higher than 0.20 (see Table VI) On the other hand, composite reliability of latent variables were 0.93, 0.89, 0.93, 0.92, which were higher than 0.60. According to Bagozzi and Yi's study [19], the reliability of this scale reached acceptable criteria.

TABLE IV
CORRELATION MATRIX OF OBSERVED VARIABLES

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8
Y 1	1							
Y 2	.72*	1						
Y 3	.73*	.72*	1					
Y 4	.43*	.60*	.47*	1				
Y 5	.50*	.65*	.54*	.75*	1			
Y 6	.54*	.58*	.61*	.64*	.72*	1		
Y 7	.44*	.43*	.45*	.41*	.50*	.49*	1	
Y 8	.37*	.35*	.36*	.30*	.38*	.37*	.54*	1
	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16
Y 9	1							
Y 10	.59*	1						
Y 11	.50*	.41*	1					
Y 12	.64*	.59*	.46*	1				
Y 13	.31*	.30*	.58*	.38*	1			
Y 14	.29*	.55*	.41*	.86*	.89*	1		
Y 15	.32*	.55*	.42*	.74*	.75*	.74*	1	
Y 16	.39*	.62*	.42*	.66*	.67*	.70*	.77*	1
	Y17	Y18	Y19	Y20	Y21	Y22	Y23	Y24

Y 17	1							
Y 18	.80*	1						
Y 19	.28*	.26*	1					
Y 20	.37*	.28*	.74*	1				
Y 21	.25*	.20*	.81*	.80*	1			
Y 22	.29*	.27*	.76*	.75*	.83*	1		
Y 23	.30*	.31*	.76*	.75*	.80*	.80*	1	
Y 24	.30*	.30*	.74*	.77*	.80*	.86*	.90*	1

* $p < .05$

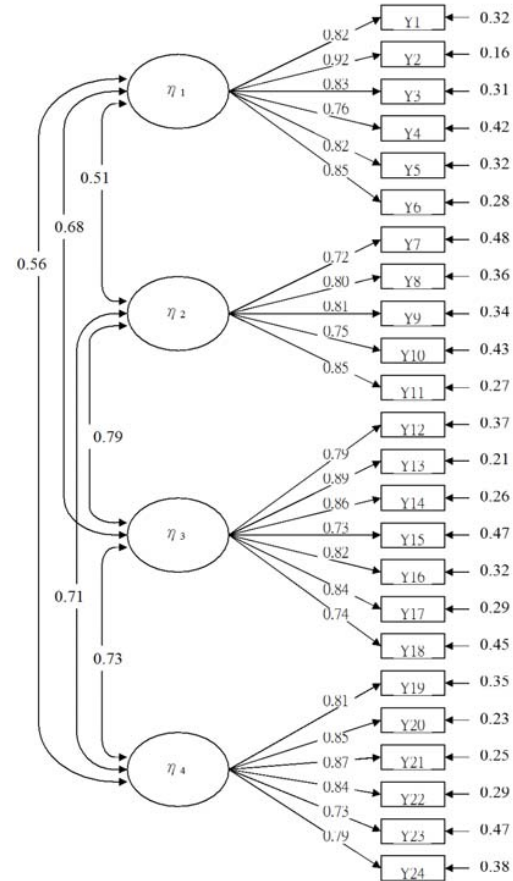


Fig. 1 Standardized parameter estimation of hypothetical model

TABLE V
ABSTRACT OF FIT INDEX FOR CONFIRMATORY FACTOR ANALYSIS

	standardized estimation	t value		error value	t value
λ_{11}	0.82	12.44*	δ_1	0.32	12.44*
λ_{21}	0.92	12.04*	δ_2	0.16	12.04*
λ_{31}	0.83	12.41*	δ_3	0.31	12.41*
λ_{41}	0.76	12.36*	δ_4	0.42	12.36*
λ_{51}	0.82	12.38*	δ_5	0.32	12.38*
λ_{61}	0.85	11.81*	δ_6	0.28	11.81*
λ_{72}	0.72	10.32*	δ_7	0.48	10.32*
λ_{82}	0.80	12.04*	δ_8	0.36	12.04*
λ_{92}	0.81	11.93*	δ_9	0.34	11.93*
$\lambda_{10,2}$	0.75	12.09*	δ_{10}	0.43	12.09*
$\lambda_{11,2}$	0.85	11.74*	δ_{11}	0.27	11.74*
$\lambda_{12,3}$	0.79	8.56*	δ_{12}	0.37	8.56*
$\lambda_{13,3}$	0.89	12.20*	δ_{13}	0.21	12.20*
$\lambda_{14,3}$	0.86	12.17*	δ_{14}	0.26	12.17*
$\lambda_{15,3}$	0.73	9.08*	δ_{15}	0.47	9.08*
$\lambda_{16,3}$	0.82	11.85*	δ_{16}	0.32	11.85*
$\lambda_{17,3}$	0.84	12.37*	δ_{17}	0.29	12.37*
$\lambda_{18,3}$	0.74	12.30*	δ_{18}	0.45	12.30*
$\lambda_{19,4}$	0.81	10.69*	δ_{19}	0.35	10.69*
$\lambda_{20,4}$	0.85	12.33*	δ_{20}	0.23	12.33*
$\lambda_{21,4}$	0.87	12.16*	δ_{21}	0.25	12.16*
$\lambda_{22,4}$	0.84	12.09*	δ_{22}	0.29	12.09*
$\lambda_{23,4}$	0.73	4.13*	δ_{23}	0.47	12.41*
$\lambda_{24,4}$	0.79	7.25*	δ_{24}	0.38	12.39*
RMSEA		0.03			
p		0.02			
χ^2		(246, N=318)=557.64			
GFI		0.96			
AGFI		0.95			
NFI		0.91			
CFI		0.98			
RMR		0.04			
Standardized RMR		0.03			

* $p < .05$

TABLE VI
ABSTRACT OF EACH ITEM RELIABILITY, AVERAGE VARIANCE EXTRACTED
AND COMPOSITE RELIABILITY

Variable	Item reliability(r^2)	Average variance extracted(AVE)	Composite reliability(CR)
(η_1)		.70	.93
Teaching identification			
Y1	.68		
Y2	.84		
Y3	.69		
Y4	.58		
Y5	.68		
Y6	.72		
(η_2)		.62	.89
Teaching involvement			
Y7	.52		
Y8	.64		
Y9	.66		
Y10	.57		
Y11	.73		
(η_3)		.66	.93
Teaching objectives			
Y12	.63		
Y13	.79		
Y14	.74		
Y15	.53		
Y16	.68		
Y17	.71		
Y18	.55		
(η_4)		.67	.92
Tendency towards work continuation			
Y19	.65		
Y20	.77		
Y21	.75		
Y22	.71		
Y23	.53		
Y24	.62		

TABLE VII
THE CONFIDENCE INTERVAL OF CORRELATION COEFFICIENT FOR EACH
PARAMETER

	1. Teaching identification	2. Teaching involvement	3. Teaching objectives	4. Tendency towards work continuation
1. Teaching identification	1			
2. Teaching involvement	0.51 (0.47;0.55)	1		
3. Teaching objectives	0.68 (0.65;0.71)	0.79 (0.75;0.83)	1	
4. Tendency towards work continuation	0.56 (0.49;0.63)	0.71 (0.67;0.75)	0.73 (0.70;0.72)	1

IV. DISCUSSION AND CONCLUSION

This scale was examined by exploratory factor analysis and confirmatory factor analysis. The results provided the evidences of great reliability and validity. In the first stage, we used exploration factor analysis to obtain 74.30% of the total variance explained. The Cronbach's alpha coefficient of sum scale reliability was 0.94, with subscales between 0.80 and 0.96. In the second stage, confirmatory factor analysis was used to test construct validity. The result showed that the fit index were acceptable ($\chi^2_{(246)} = 557.64$, $p < .05$, RMSEA = 0.03, GFI = 0.96, AGFI = 0.95, NFI = 0.91, CFI = 0.98, RMR = 0.04, SRMR = 0.03). Average variances extracted of latent variables were 0.70, 0.62, 0.66, 0.67, and composite reliability was 0.93, 0.89, 0.93, 0.92. Based on the confirmatory factor analysis, the hypothesis model could be examined by others fit index if χ^2 index does reach significant level [20]. According to other crucial index, the hypothesis model was accepted due to the fit index of GFI, AGFI, and CFI are above 0.90, and RMR is below 0.05[20],[21]. Overall, the reliability and validity of the scale have reached a high-quality level.

This scale has four stable factors: teaching identification, teaching involvement, teaching objectives and tendency towards work continuation. First, teaching identification is an important component presented by previous researchers [3], [14]. In fact, if teachers identify with their work, they will have higher commitment toward teaching and will put more effort on it. Furthermore, teaching involvement is also another important factor of teaching commitment, some researchers indicated that teaching involvement is crucial for teaching commitment[3], [13]-[15]. If teachers are willing to involve more time and effort, they will reveal better attitude in teaching commitment. Moreover, teaching objective is also an important component of teaching commitment [13],[15],[16]. Once teachers have better attitudes to achieve teaching objectives, they would have higher teaching commitment. Finally, previous researchers also demonstrated that the tendency towards work continuation is an important factor of teaching commitment [3], [14], [15]. If teachers have higher tendency towards work continuation, they would hope to remain their work in health and physical education.

In summary, the TCS-HPE is a good measurement inventory with reliability and validity. It has 24 items and four stable factors, which are teaching identification, teaching involvement, teaching objective and tendency towards work continuation. It can be applied to test the teaching commitment of health and physical education teachers in Taiwanese elementary schools. Although the reliability and validity of the TCS-HPE were strictly examined through a series procedures, the application in other countries should be more cautious due to the sample of this study was confined in Taiwan. In order to obtain the evidences of cross-culture validity, we strongly suggest that researchers should examine the structure of the TCS-HPE in different areas.

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