A STUDY ON THE DEVELOPMENT AND APPLICATION OF TEACHER PROFESSIONAL CAPITAL INSTRUMENT

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Abstract - The purposes of this study were as follows: first, to review the related knowledge body of teacher professional capital, second, to develop the instrument of teacher professional capital, and third, to use the instrument to assess the current situation of teacher professional capital in elementary and secondary schools in Taipei. Survey method was employed in this study. A pilot study was administered to 120 school teachers to develop the instrument of teacher professional capital. Subsequently, to analyze the situation of teacher professional capital. The collected data were analyzed through the methods of item analysis, reliability analysis, validity analysis and means. The main findings of this study are as follows: (1)The questionnaire of teacher professional capital about the discriminatory power, reliability and validity are good. (2) The current situation of teacher professional capital in Taipei is in moderately high level. Finally, according to the findings of this study, this author will propose several suggestions for the implementation of teacher professional capital, and further studies respectively.

Keywords - Elementary and Secondary Teacher, Professional Capital, Teacher Professional Development

I. RESEARCH MOTIVATION

Drucker (1954), the Master of Management, demonstrated in The Practice of Management that human resource is the only component in all resources that could expand its function. The Every Student Succeeds Act (ESSA) was signed into law by President Obama on Dec 10, 2015. The ESSA highlights the importance of employing highly qualified teachers (Burke, 2012). The Organization for Economic Cooperation and Development (OECD) also specifies that people usually gauge a school's performance based on the school's cultivation of talents (Hau, C.S. & Li, K. Y, 2016). In other words, teachers are the key role of the education system, and their own professionalism and competence will be the main key to influence students and schools' performance and success.

Hargreaves and Fullan (2012) have once proposed the concept of professional capital to explore the connotation of teachers' professional capital. The so-called "professional" is "being professional", that is, showing professional performance and adhering professional ethics at work which means to show the professional quality and characteristics that teachers have been expected for (Chen, P. Y., 2017). And the so-called "capital" is an asset that an organization has available to create its performance and to increase its benefits. Therefore, the professional capital of school teachers should be valued.

The purpose of this study is to develop investigation tools of teachers' professional capital and to understand the current status of teachers' professional capital of elementary and secondary schools in Taipei City. This research specially studies the problems of (1) the discriminatory power, reliability and validity of teachers' professional capital questionnaires (2) the current status of professional capital of elementary and secondary school teachers in Taipei City.

II. THE CORRELATED CONCEPT OF TEACHERS' PROFESSIONAL CAPITAL

The concept of professional capital is brought up by Hargreaves and Fullan in 2012 which includes "human capital", "social capital", and "decision capital". The aforementioned capitals are important components of effective teaching and the improvement of self-teaching and the better performance of teaching team (Hargreaves & Fullan, 2013).

Human capital refers to the accumulation of professional skills. This perception highlights that individuals can develop valuable knowledge and skills through education or training. Therefore, investment in education will gain economic return. As far as teaching is concerned, teachers' professional development and cultivation is one kind of investment of human capital (Fullan, 2016; Hargreaves & Fullan 2012). It includes improving teachers' ability to set appropriate learning objectives, understanding the uniqueness of each individual student and applying differentiated teaching ability, and possessing the ability to plot innovative teaching and design multiple assessments. However, the human capital of teachers can not be increased alone, it must work through teamwork to impel individuals to grow continuously and teamwork cooperation is part of social capital (Hargreaves & Fullan, 2012).

Social capital includes three fundamental elements: network, norms, values and expectancies shared by group members, and sanctions which helps affirming norms of conducts and network operations (Halpern, 2005)).

The most important profession of a teacher is to make a decision or judgment, and all teachers' teaching performance is subject to judgment (Chien, H. C., 1998; Shavelson, 1973). "Decision capital" means

teachers can make best judgment, apply best teaching strategies and take best actions based on their professional knowledge and experience when confronting different students and different teaching scenario. It must be developed through years of practical teaching experience just as doctors and attorneys (Hargreaves & Fullan, 2012).

In order to help school teachers and leaders to understand their p rofessional capital development status, Hargreaves and Fullan (2012) have designed questionnaires to survey teachers' professional capital. Nevertheless, with the serious shortage of teachers in the U.S., non-specialized teachers' teaching, a low number of experienced senior teachers (Garcia & Weiss, 2019), lower average salary of teachers than that of those with the same qualifications (Chen, T. C. 2019), and insufficient respect for teachers from the public, the teacher structure in the U.S. is different from the current one in Taiwan (Huang & Fu, 2009). Therefore, it is necessary to design questionnaires to understand teachers' professional capital of Taiwan in view of the current situation of professional capital of elementary and secondary school teachers in Taiwan.

III. RESEARCH DESIGN AND IMPLEMENTATION

A. Research Object

After the pretest questionnaires were written, 120 elementary and secondary school teachers were purposively sampled as pretest subjects. Among the 120 pretest questionnaires distributed, 117 were retrieved. 117 are valid copies and the availability is 117 with 97.5% availability ratio.

B. Research Tools

The questionnaire of teachers' professional capital is mainly referred to the correlative bibliography of Hargreaves and Fullan (2012) and Osmond-Johnson (2017) and to compose the "Questionnaire on Teachers' Professional Capital of Elementary and Secondary Schools". It includes scales of (1) Human Capital (2) Social Capital and (3) Decision Capital.

The measurement of the Questionnaire on Teachers' Professional Capital of Elementary and Secondary Schools invited testees filling out all questions with a prudent and objective manner. Each teacher responded every topic from "fully compliant" to "completely non-compliant" in terms of 7, 6, 5, 4, 3, 2, 1, respectively. The higher points represent better performance of teachers' professional capital.

C. Data Analysis Method

After retrieving the Questionnaire on Teachers' Professional Capital of Elementary and Secondary Schools, statistical methods such as t test, construct validity, Cronbach alpha reliability analysis, mean, and Repeated Measures were used to understand the questionnaires' discriminatory power, factory analysis, reliability, and the current status of teachers' professional capital.

IV. RESEARCH RESULT AND ANALYSIS

A. Discriminatory Power Analysis

The scale of this research used each question's Critical Ratio (CR) to understand every question's discriminatory power. The result of the analysis is showed in Table 1. As showed in Table 1, there are 21 questions in the Questionnaire of Teachers' Professional Capital of Elementary and Secondary Schools. After each question was tested by t test, we found that CR was ranged from 6.36 to 12.36, and they all exceeded the customary standard 3.5(Wang, 2006) reaching significant difference standard. This founding indicates that the scale of the 21 questions in the Teachers' Professional Capital of Elementary and Secondary Schools research has excellent discriminatory power.

B. Factor Analysis

The Exploratory Factor Analysis (EFA) of this study used Principal Factor Analysis to extract factors. It also used Varimax rotation and took eigenvalue greater than 1 as the screening standard. After the first factor analysis, it is found that 3 factors were extracted out. Since the factor loading of the first question under decision capital dimensionality was low, the question with smaller load of this factor is removed first (less than. 40). We then employed Principal Factor Analysis, Varimax, and the eigenvalue greater than 1 to proceed EFA.

We found the questions of this research converged into 3 factors among which, one factor is "human capital" with its factor loading ranging from .62 to .81 eigenvalue at 5.16 and explained variation at 25.18%. The second one is "social capital" with its factor loading ranging from .54 to .85, eigenvalue at 5.15, and explained variation at 25.73%. The third factor is "decision capital" which has factor loading ranges from .58 to .81, eigenvalue at 3.95, and explained variation at 19.75%. And the total construct validity explains that variation is 71.26% (Table 2). This also conforms to the perspectives of Wang (2006) which states that, in social science, it would be appropriate if the explained variations reaches at 60% or above from the retention factor that the factor analysis determines.

C. Reliability Analysis

Reading from Table 3, we learned that the total Cronbach α coefficient of the "Questionnaires of Elementary and Secondary School Teachers' Professional Capital" is 0.95, and the Cronbach α coefficients of each dimension in human capital, social capital, and decision capital is 0.93, 0.92, and 0.92 respectively. Either the total or individual dimensionality has met above 0.7 standard indicated by Wu (2005). It means the questionnaire of

"Elementary and Secondary School Teachers' Professional Capital" has high reliability and the internal consistency is excellent.

D. Current Status Analysis of Elementary and Secondary School Teachers' Professional Capital

Table 4 shows the overall and individual dimensionality of the professional capital of elementary and secondary schools in Taipei City. From Table 4, we know that the professional capital of elementary and secondary teachers rests at the point of 5.96. As 5.01-6.00 points is in accordance with "moderately high performance" 6.01-7.00 is in accordance with "high performance" in terms of the 7-point scale, we can infer that the professional capital of elementary and secondary school teachers in Taipei City is "moderately high performance". Meanwhile the score of each dimensionality is as follows: social capital (M=6.13), human capital (M=5.93), and decision capital (M=5.84). However, the score of each dimensionality reaches above medium to high performance. After analyzing with repeated measures F test, it is found that the difference of score between each dimensionality has reached a significant level ($F=17.68$, $p<.001$), and "social capital" has the highest score, followed by "human capital" and "decision capital" has the lowest score among the comparison.

CONCLUSION AND SUGGESTIONS

Conclusion

1. "The Questionnaires of Elementary and Secondary School Teachers' Professional Capital" has excellent discriminatory power.

There are 21 pretest questions in the "Questionnaires of Elementary and Secondary School Teachers' Professional Capital". We then invited 120 teachers from elementary and secondary school teachers in Taipei City as research objects to further analyze the questionnaires' discriminatory power. It is found that all questions are retained and the criticality has remarkable difference with the score of CR reaching above the customary standard 3.5. This means the questions on each scale has excellent discriminatory power.

2. "The Questionnaires of Elementary and Secondary School Teachers' Professional Capital" has excellent exploratory construct validity.

After analyzing the discriminatory power, exploratory construct validity is analyzed as well. One question is deleted after two times of Principal Component Analysis. We found that the questions converged into 3 factors: "Human Capital", "Social Capital", and "Decision Capital". Human capital has its factor loading between .62 and .81, with its eigenvalue at 5.16, and explained variation at 25.18%. The social capital has its factor loading ranging from .54 - .85, eigenvalue at 5.15, and explained variation at 25.73%. The decision capital has factor loading has factor loading ranging from .58 to .81, eigenvalue at 3.95, and explained variation at 19.75%. And the total construct validity explained variation is 71.26%.

3. "The Questionnaires of Elementary and Secondary School Teachers' Professional Capital" has high reliability.

After factor analysis, we conduct reliability analysis of Questionnaires of Elementary and Secondary School Teachers' Professional Capital. We found that the overall Cronbach α coefficient is 0.95, and the Cronbach α coefficients of each dimension in human capital, social capital, and decision capital is 0.93, 0.92, and 0.92 respectively. It means the research of this questionnaires has excellent internal consistence and high reliability.

4. "The Questionnaires of Elementary and Secondary School Teachers' Professional Capital" has good teachers' professional capital.

When analyzing the questionnaires, we found that teachers in Taipei municipal elementary and secondary schools have mid-high level of professional capital which means they have pretty good teachers' professional capital. With repeated measured ANOVA analysis, we also found that social capital has the highest performance of Taipei municipal elementary and secondary schools, followed by human capital and decision capital.

Suggestions

1. Make good use of the questionnaires of teachers' professional capital for self-review.

This research completed the "Questionnaires of Elementary and Secondary Schools Teachers' Professional Capital" based on the correlative bibliography and we found that this questionnaire has good discriminatory power, validity and reliability. Thus, we suggest using the contents of this questionnaires as self-check list for teachers' professional capital in the future for elementary and secondary school teachers' self-review and to understand the current status of individual teacher's professional capital as a reference for planning teachers' professional development.

2. Encourage sharing of teachers' conversation to increase teachers' decision capital.

It is found that the performance of Taipei municipal school teachers reaches at mid-high level, among which, the decision capital has relevant low performance comparing to human capital and social capital. Therefore, we suggest, in the future, elementary and secondary schools actively encouraging teachers cooperate collectively to share and learn problem solving strategy of curriculum, teaching, assessment, and classroom management, and through the process of sharing and learning to increase the competency of decision making and

judgement when confronting issues and problems in order to improve the decision capital

3. Proceed Confirmatory Factor Analysis (CFA) exploratory theoretical model .

This research completed the "Questionnaires of Elementary and Secondary Schools Teachers' Professional Capital" and found the research has pretty good discriminatory power, validity and reliability. In order to further understand the factor structure of teachers' professional capital stability, we suggest, when conducting questionnaires in the future, we can analyze the theoretical model's goodness of fit, absolute fit, increase fit, and parsimony fit simultaneously to construct a theoretical model of greater goodness of fit and stability.

4. Continue correlative research on teachers' professional capital.

This research completed the "Questionnaires of Elementary and Secondary Schools Teachers' Professional Capital" and found the research has pretty good discriminatory power, validity and reliability. Therefore, we suggest, in the future, the correlative research on teachers' professional capital such as the investigation research on elementary and secondary school teachers' professional capital, correlation on teaching effectiveness and teachers' professional capital, correlative research on teachers' professional capital and teachers professional learning community can be conducted based on this questionnaire to understand and construct the theory and practice of localized teachers professional capital.

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Table 1: Analysis of Elementary and Secondary School Teachers' Professional Capital Scale

Dimensionality	Item Number	CR	Dimensionality	Item Number	CR	Dimensionality	Item Number	CR
Human Capital	1	8.55***	Social Capital	1	9.11***	Decision Capital	1	7.43***
	2	10.28***		2	10.45***		2	6.47***
	3	8.9*		3	8.04***		3	9.22***
	4	10.02***		4	11.79***		4	9.75***
	5	10.71***		5	9.02***		5	8.84***
	6	12.36***		6	6.36***		6	9.85***
	7	11.43***		7	7.33***		7	8.05***

*** $p < .001$

Table 2: EFA of "Elementary and Secondary School Teachers' Professional Capital Scale"

Dimensionality	Item Number	Factor Loading	Eigenvalue	Explained Variation	Total Explained Variation
Human Capital	1	.62	5.16	25.78	71.26
	2	.75			
	3	.78			
	4	.79			
	5	.81			
	6	.80			
	7	.79			
Dimensionality	Item Number	Factor Loading	Eigenvalue	Explained Variation	
Social Capital	1	.85	5.15	25.73	
	2	.83			
	3	.82			
	4	.81			
	5	.75			
	6	.68			
	7	.54			
Dimensionality	Item Number	Factor Loading	Eigenvalue	Explained Variation	
Decision Capital	2	.68	3.95	19.75	
	3	.78			
	4	.58			
	5	.62			
	6	.81			
	7	.78			

Table 3: Reliability Analysis of "Elementary and Secondary School Teachers' Professional Capital Scale"

	Human Capital Scale	Social Capital Scale	Decision Capital Scale	Total Capital
α coefficient	0.93	0.92	0.92	0.95

Table 4: Analysis Abstract Table of Mean, Repeated Measures, and F Test of Individual Dimensionality on Elementary and Secondary School Teachers' Professional Capital

Dimensionality	Number of	Mean	Standard Deviation	*F Test*	Posteriori Comparisons
(1) Human Capital	117	5.93	0.06	17.68***	(2)>(1),(3)
(2) Social Capital	117	6.13	0.69		(1)>(3)
(3) Decision Capital	117	5.84	0.65		
Overall Professional Capital	117	5.96	0.67		

$^{***}p < .001$

★★★