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Teacher perceptions of professional role and innovative teaching at elementary schools in Taiwan

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The purpose of the study is to explore the association between primary school teachers' perceptions of professional role and their innovative teaching in Central Taiwan. Quantitative research methods were employed, and data were collected from 554 Central Taiwanese teachers. The results of the present study indicated that elementary school teachers have highly perceived professional services and professional ethics for professional roles, and the teachers performed well in ideal thinking for innovative teaching. Also, the professional role perceptions of teachers, particularly the dimension of professional development, were significantly positively correlated with innovative teaching. Finally, the analysis results showed that the professional role perceptions, specifically the professional development dimension, effectively predicted innovative teaching.

Key words: Professional role, innovative teaching, elementary school teachers, Taiwan.

INTRODUCTION

Influenced by the globalization, democratization, and diversification of social development, Taiwanese education in the twenty-first century has undergone a series of reform. During the process of social change in Taiwan, compulsory education has transformed from a singular, centralized, campus-based, and conservative system to a diverse, decentralized, community-based, and innovative approach (Ministry of Education [MOE], 2013). The quality of education depends on teachers, who are the essential factors contributing to the educational success of schools. The competency of teachers is imperative since teachers who participate in educational work profoundly influence the future

developments of their students (Santoro et al., 2012). The recent low birth rate has substantially affected Taiwanese society. This is in addition to the 12-year compulsory education which emphasizes increasing the educational quality of elementary and middle schools, facilitating the achievement of children, and consolidating national competitiveness. Most people in the society believe that education is an essential indicator for cultivating talented personnel and improving national competitiveness. Therefore, educational opportunity is no longer the focus of topics regarding education reform; instead, improving educational and teaching quality and implementing innovative teaching should be emphasized (MOE, 2013).

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Therefore, the relationship between how teachers perceive their professional role and apply innovation to teaching merits further investigation. Moreover, whether their teaching ideology, class and assessment design, and the innovation behavior in seeking resources and teaching methods are positively influenced during the process wherein teachers perceive their professional role and devote to teaching, is also a topic warranting further exploration.

Overall, this study investigated the current situations regarding teachers' perceptions of professional role and their innovative teaching and examined the predictability of these two aspects. Finally, conclusive findings and recommendations are proposed to serve as references for the education administration authority, schools, and teachers.

LITERATURE REVIEW

Implications of teacher professional role perception

The concept of professionalism involves the possession of expert knowledge and ability related to a particular occupational field. Professionals can independently and autonomously perform their duties and provide specialized services. Furthermore, they are adept at controlling their own work protocols and procedures and professionally organizing and formulating regulations that maintain morality and discipline. Through continual advanced training and studying, professionals develop a high level of professional identification and a strong sense of purpose regarding their work content, and establish rational and rigorous regulation and certification standards, which ultimately help them gain professional respect and professional authority and enable them to complete their work assignments (Evetts, 2012).

Categorizing educational work as a profession has been debatable, and thus, educational organizations are still attempting to promote teaching occupation as a form of profession. The professional development of teachers involves a process of developing their semi-profession and quasi-profession, to full profession. Consequently, the professional role of teachers is manifested through their professional identification (Gamble, 2010; Ingersoll and Merrill, 2011; Hightower, 2011). Moreover, teachers must constantly adjust their professional role to meet the requirements of the society and to acquire professional self-esteem within the society.

Overall, teachers' perception of professional role is the role perception regarding teaching as a profession; it refers to the behaviors that teachers should demonstrate or their cognitions established from the psychological process of reflecting, determining, integrating, selecting, and organizing the traits and behaviors of their professional role, which is established according to social changes, their professional development, and social

expectations (Caires et al., 2012; Cristina-Corina and Valerica, 2012).

According to previous studies, teachers' perception of professional role can be divided into six dimensions of role perception, namely, professional knowledge, services, ethics, autonomy, development, and organization (Hyslop-Margison, 2010; Tyree Jr., 1996).

Implications of innovative teaching

Innovation involves modifying or introducing new ideas, an approach essential to economic growth. Innovation grants an individual the ability to create wealth by utilizing accessible resources and applying novel ideas and concepts in problem-solving strategies (Amabile, 1996; Craft, 2005; Ritchhart, 2004; Rogers, 2003). Innovation is a process of combining creativity and practicability as well as a purposeful, systematic problem-solving method that facilitates value addition. Through careful deliberation, flexible decisions, and systematic use of novel concepts and technology, innovation can progressively promote and guide education reform and advancement toward a positive and favorable direction. Creativity is the basis of innovation, but when creativity is lacking, innovative ideas cannot be created, let alone the act of innovation. Creativity and innovation are closely related; therefore, their concepts overlap, sharing a commonality (Adams, 2005; DeHaan and Ebert-May, 2009; Levitt, 2002).

According to previous studies, the content of innovative teaching can be categorized into five dimensions, namely ideal thinking, curriculum content, teaching resources, teaching methods, and diverse assessment (Amabile, 1996; Hennessey, 2003).

Studies related to teacher perceptions of professional role and innovating teaching

To examine the relationship between the professional development and innovative teaching of teachers, Hsieh (2009) and Yang (2010) have conducted a questionnaire survey on elementary school teachers. Hsieh (2008) focused on vocational school teachers, investigating the relationship between the professional development and innovative teaching of teachers and the confounding effects of organizational innovative climate. The results of the Pearson product-moment correlation conducted in these studies have revealed a significantly positive correlation between the professional development and innovative teaching of teachers.

In addition, Hsieh (2009) indicated that the interpersonal communication of professional development and the teaching resource of innovative teaching exhibited the strongest correlation and the results of the multiple regression analysis verified that

interpersonal communication effectively predicted the overall innovative teaching. Yang (2010) performed two-way analysis of variance to investigate the influence of teachers' personal backgrounds and teaching innovation on the professional development of teachers, and the results indicated that these two factors did not significantly affect the professional development of teachers. By using a hierarchical regression model, Hsieh (2008) determined that the encouragement of vocational school administrators moderated the relationship between the professional development and teaching innovation of teachers; indicating that frequent encouragement and approval by school administrators weakens the positive influence that teacher's professional development has on teaching innovation.

To examine the relationship between the professional commitments and innovative teaching of elementary school teachers, Cheng (2008) applied a questionnaire survey and Pearson product-moment correlation analysis. The results revealed that professional commitment and innovative teaching were significantly positively correlated. Specifically, the professional commitment of teachers yielded the highest correlation with the dimension of teaching method improvisation. Chiu (2010) indicated that professional development, a dimension of professional commitment, exhibited the strongest correlation with teaching innovation. Regarding predictability, Cheng (2008) adopted professional commitment and teaching innovation as the predictor variables and teaching effectiveness as the criterion variable. The results showed that the dimension of teaching method improvisation exhibited the highest predictability. By contrast, Chiu (2010) indicated that the teaching evaluation dimension in innovative teaching predicted professional commitments most efficiently.

To investigate the relationship between the professional identification and innovative teaching of teachers, Yeh (2012) conducted a questionnaire survey on arts and humanities teachers in middle schools, showing that professional identification of teachers exerted no moderating effect on the implementation of innovative teaching.

Overall, previous studies have focused on only how the professional development, commitment, or identification of teachers is related to their innovative teaching. The results of these studies showed that professional development and commitment are positively correlated with innovative teaching, whereas professional identification exerted no moderating effect on innovative teaching. In recent years, the social change in Taiwan and the effect of education reform have influenced how teachers redefined their professional role and implement innovative teaching. Therefore, how to objectively investigate the relationship between the professional role perception and innovative teaching of teachers is a critical topic for evaluating the professional development and innovating teaching of teachers.

METHODOLOGY

Participants

The participants of this study were teachers (excluding substitute teachers) who worked at public elementary schools in Central Taiwan, Taiwan.

Pilot test participants

A pilot test was randomly selected and conducted on two schools each from the Central District, Tun Districts, Greater Shanxian, and Greater Haixian of Central Taiwan and 145 questionnaires were distributed. 145 questionnaires were recovered, of which 143 were valid, yielding a valid return rate of 98.62%.

Formal test participants

Stratified sampling was used from the Taichung City District. Currently, Taichung City has 29 administrative areas and 226 elementary schools. Because of the large population, the schools were divided according to the administrative area. First, Taichung City public elementary schools were divided into a total of four districts: the divisions of Taichung City and Tun Districts, the Mountain and Coastal regions. Second, one-fifth of the schools in each district were selected and sampling proportions were assigned based on the scale of the school. Overall, 575 formal questionnaires were distributed and 563 were retrieved. Nine incomplete questionnaires were eliminated; therefore, 554 valid questionnaires were obtained, yielding a usability rate of 96.52%.

Research instruments

Questionnaire survey method was adopted. The instrument used in this study was a self-developed questionnaire on the professional role perceptions and innovative teaching of elementary school teachers. A preliminary questionnaire was first created according to a literature review. Subsequently, professional scholars were invited to assess the preliminary questionnaire for establishing the expert validity. Following the pilot test, the collected data was processed and analyzed to verify the reliability and validity of the questionnaire and formulated a formal questionnaire according to the pilot test results.

The formal questionnaire comprised three parts: the demographic information of the participants, questionnaire for the professional role perceptions of teachers, and questionnaire for the innovative teaching of teachers.

The demographic information included the sex, highest educational attainment, years of service, current job position, school size, and school location of the public elementary school teachers.

The questionnaire for the professional role perceptions comprised six dimensions, including professional ethics, professional knowledge, professional services, professional development, professional organizations, and professional autonomy. The preliminary questionnaire contained 30 questions, which were evaluated using a 5-point Likert-type scale with scores ranging from 5 to 1, which respectively denotes "strongly agree," "moderately agree," "agree," "moderately disagree," and "strongly disagree." The participating teachers who received high scores demonstrated favorable role perceptions in these dimensions.

The questionnaire for innovative teaching contained five dimensions, including ideal thinking, curriculum content, teaching resources, teaching methods, and diverse assessment. The

Table 1. Pearson product-moment correlation for study variables (**p<0.001).

Correlation	Professional knowledge	Professional services	Professional ethics	Professional autonomy	Professional development	Professional organizations	Total
Ideal thinking	0.43***	0.55***	0.56***	0.52***	0.57***	0.40***	0.64***
Curriculum content	0.48***	0.48***	0.57***	0.56***	0.68***	0.43***	0.69***
Teaching resources	0.41***	0.27***	0.41***	0.39***	0.60***	0.50***	0.59***
Teaching methods	0.50***	0.44***	0.52***	0.55***	0.65***	0.39***	0.66***
Diverse assessment	0.52***	0.37***	0.47***	0.51***	0.61***	0.41***	0.63***
Total	0.56***	0.49***	0.60***	0.60***	0.74***	0.51***	0.76***

Table 2. Canonical Correlation analysis.

Control variable	Canonical factor				Criterion variable	Canonical factor			
Variable X	χ_1	χ_2	χ_3	χ_4	Variable Y	η_1	η_2	η_3	η_4
professional knowledge	-0.692	-0.058	0.463	0.505	ideal thinking	-0.824	0.409	-0.308	0.234
professional services	-0.670	0.586	-0.246	0.170	Curriculum content	-0.904	0.061	0.076	-0.286
professional ethics	-0.786	0.270	-0.106	0.012	teaching resources	-0.754	-0.628	-0.151	-0.038
professional autonomy	-0.770	0.240	0.254	0.069	teaching methods	-0.862	0.014	0.343	-0.149
professional development	-0.939	-0.166	0.071	-0.284	Diverse assessment	-0.808	-0.203	0.431	0.329
professional organizations	-0.640	-0.436	-0.470	0.306					
Extract variance (%)	57.171	11.582	9.611	7.714	Extract variance (%)	69.176	12.136	8.546	5.366
Overlap (%)	35.987	1.652	0.565	0.192	Overlap (%)	43.544	1.731	0.503	0.134
					ρ^2	0.629	0.143	0.059	0.025
					ρ	0.793***	0.378***	0.243***	0.158*

* $p < 0.05$. *** $p < 0.001$.

preliminary questionnaire contained 23 questions, which were evaluated using a 5-point Likert-type scale with scores ranging from 5 to 1.

Implementation and analysis of pretest questionnaires

The revised items were formulated into the pretest questionnaire. Item, factor, and reliability analyses were conducted on the returned questionnaires to test for validity and reliability. Details are shown as follows.

Validity analysis

A t-test was conducted on the highest scoring group (the top 27%) and the lowest scoring group (the bottom 27%), and the critical value (CR; t-value) of each item was derived. Items with a CR of less than 3.0 and with a correlation coefficient (r-value) of less than 0.30 were deleted. Moreover, a Kaiser-Meyer-Olkin (KMO) value of greater than 0.70 was used to test whether or not the factors were suitable. The KMO value of the profession role perceptions after these items were eliminated was 0.84; the chi-square value in the Bartlett's test of sphericity was 2113.03 and the degree of freedom was 406, which reached a level of significance ($p < 0.001$). The cumulative explained variance was 64.32%. The KMO value of innovative teaching after elimination was 0.89. The chi-square value in the Bartlett's test of sphericity was 1680.28. The degree of freedom was 253, which reached a

level of significance ($p < 0.001$). The cumulative explained variance was 65.22% (as shown in Tables 1 and 2).

Reliability analysis

The α coefficients of various dimensions in the profession role perception questionnaire and the overall scale were above 0.71 and 0.92, respectively. The α coefficients of various dimensions in innovative teaching questionnaire and the overall scale were above 0.72 and 0.85, respectively. This indicated that the dimensions and the overall scale had superior internal consistency and reliability (as shown in Tables 1 and 2).

RESULTS AND DISCUSSION

Teachers' perceptions of professional role and innovative teaching

A 5-point Likert scale with an average score of 3 points was used to evaluate the results of the questionnaires for professional role perceptions and innovative teaching. The participants who scored more than 3 points in a certain dimension demonstrated a favorable perception or performance in that dimension. A score of

2 points or less, 2-3 points, 3-4 points, 4 points or more, respectively indicated a low, moderate, moderately high, and high degree of perception or performance. Descriptive statistics was employed to analyze the scores obtained by the participants.

Teachers' perceptions of their professional role

According to the results, the score for each dimension, in overall, ranged from 3.93 to 4.43, indicating that the teachers exhibited a moderately high and high levels of perception regarding their professional role. For the overall perceptions of professional role, an average score of 4.20 was achieved, representing a high level of perception; which indicates that the teachers favorably perceived their professional role. In terms of each dimension, the participants received the highest average score for professional services ($M = 4.43$), followed by professional ethics ($M = 4.42$), professional autonomy ($M = 4.25$), professional knowledge ($M = 4.23$), professional development ($M = 4.11$), and professional organizations ($M = 3.93$). Specifically, the relatively high scores for professional services and ethics indicated that the elementary school teachers perceived these two dimensions of professional role most favorably. In addition, the participants demonstrated high levels of perceptions on professional knowledge, autonomy, and development. However, the perceptions of professional organizations had the lowest score and a large standard deviation (SD) of 0.72, suggesting that the elementary school teachers perceived professional organizations, such as teachers' associations or unions, unfavorably compared with the other dimensions of professional role.

Baggini (2005) indicated that, although teaching occupation has long been accepted as a profession, teachers do not tolerate criticism and questioning of their professionalism. Based on interviews and empirical research, previous studies have found that teachers have high regards for their professionalism and high role standards and expectations of themselves and other teachers (Tichenor and Tichenor, 2005, 2009).

In addition, the reason that teachers perceive professional organizations unfavorably might be related to the various unresolved disputes between teachers and the teacher union, which prompt teachers to have reservations about the functions of professional organizations.

Innovative teaching

The results indicated that the score for each dimension, in overall, ranged from 3.70 to 4.40, indicating that the teachers exhibited moderately high and high levels of performance in innovative teaching. Regarding the overall innovative teaching, an average score of 4.11

was obtained, representing a high level of performance in innovative teaching among elementary school teachers. Among the dimensions of innovative teaching, the participants achieved the highest average score for ideal thinking ($M = 4.40$), followed by curriculum content ($M = 4.25$), teaching methods ($M = 4.18$), diverse assessment ($M = 4.05$), and teaching resources ($M = 3.70$). The score for ideal thinking was the highest, which indicated that the teachers performed favorably in this dimension. The scores for curriculum content, teaching methods, and diverse assessment also indicated a favorable performance. By contrast, the participants achieved the lowest score for teaching resources ($SD=0.70$), classified in the moderately high score range. This result suggests that the elementary school teachers could not effectively use teaching resources to implement innovative teaching.

Innovation and changes in teaching activities are inevitable, because teachers often encounter challenges derived from the rapid social change in Taiwan. Rinkevich (2011) proposed that the benefits of innovative teaching to teachers and students are unquestionable. Therefore, it was inferred that the reason teachers are concerned about innovative teaching is related to the recent trends of domestic education policies such concern facilitates establishing a solid foundation in teachers' beliefs and intrinsic motivations to apply innovative teaching.

By contrast, Wu (2007) stated that the possibility of information technology hindering interpersonal interaction and abstract thinking during innovative teaching should be avoided. Moreover, Jan emphasized that teachers should reflect on the effect of technology on teaching activities. Therefore, it was inferred that this phenomenon might be the reason teachers have reservations on the use of teaching resources in innovative teaching. Nevertheless, the results, in overall and for each dimension of innovative teaching, all imply that teachers exhibit an active and positive attitude when implementing innovative teaching.

Relationship between teacher perceptions of professional role and innovative teaching

Analysis of product-moment correlation

The analysis of Pearson product-moment correlation was used to investigate the relationship between the teachers' perceptions of professional role and innovative teaching. Table 3 shows that the professional role perception and innovative teaching were positively and significantly correlated overall ($r = 0.76$, $p < 0.001$), indicating a strong correlation between them. Regarding the correlations between the dimensions of the professional role perceptions (that is, professional knowledge, services, ethics, autonomy, development, and organizations) and

Table 3. Multiple regression analysis.

Variable	R	R ²	ΔR ²	F	β	TOL	VIF
professional services	0.741	0.549	0.549	672.247***	0.467	0.434	2.304
professional knowledge	0.763	0.582	0.033	383.922***	0.168	0.647	1.546
professional ethics	0.772	0.597	0.014	271.052**	0.115	0.496	2.017
professional organizations	0.779	0.606	0.010	211.194***	0.119	0.682	1.465
professional services	0.782	0.611	0.005	172.040*	0.086	0.643	1.556

* $p < 0.05$; ** $p < 0.001$; *** $p < 0.001$.

innovative teaching (that is, ideal thinking, curriculum content, teaching resources, teaching methods, and diverse assessment), the results indicated that all correlations of the dimensions were positive and significant ($r = 0.27-0.68$, $p < 0.05$). On an overall level and for each dimension, a high level of perception regarding professional role indicates a high level of performance in innovative teaching.

Overall and for each dimension, the professional role perceptions and teaching innovation were moderately positively correlated. Among the dimensions of the professional role perceptions, professional development had the strongest correlation with all dimensions of innovative teaching ($r = 0.74$, $p < 0.001$). In addition, among the dimensions of teaching innovation, curriculum content exhibited the strongest correlation with all the dimensions of the professional role perceptions ($r = 0.69$, $p < 0.001$).

Canonical correlation analysis

Table 4 indicates that the first, second, third, and fourth canonical correlations were statistically significant and that their p values were 0.793 ($p < 0.001$), 0.378 ($p < 0.001$), 0.243 ($p < 0.001$), and 0.158 ($p < 0.05$), respectively. Through the first four canonical factors, the six control variables (X variables) of the professional role perceptions explained 45.912% of the total variance in the five criterion variables (Y variables) of innovative teaching. The results showed that the teachers' perception of professional role is significantly related to their innovative teaching.

The first canonical factor (χ_1) of the X variables explained 62.9% ($\rho^2 = 0.629$) of the total variance in the first canonical factor (η_1) of the Y variables, whereas η_1 explained 69.176% of the total variance in the Y variables. Regarding the first canonical factors, the overlapping portion of the X and Y variables was 43.544%, indicating that, through χ_1 and η_1 professional role perceptions explained 43.544% of the total variance in innovative teaching. Regarding the first canonical correlation, all of the X variables showed a high correlation with χ_1 (> 0.6). Specifically, the structural coefficients of professional knowledge, services, ethics, autonomy, development, and organizations in the first

canonical correlation were -0.692, -0.670, -0.786, -0.770, -0.939, and -0.640, respectively. In addition, all of the Y variables showed a high correlation with η_1 . Specifically, the structural coefficients of ideal thinking, curriculum content, teaching resources, teaching methods, and diverse assessment in the first canonical correlation were -0.824, -0.904, -0.754, -0.862, and -0.808. Therefore, through the first canonical factors, dimensions of professional role perceptions affected the dimensions of innovative teaching. Furthermore, η_1 explained 62.9% ($\rho^2 = 0.629$) of the total variance in χ_1 , which explained 57.171% of the total variance in the X variables. The overlapping portion of the Y and X variables for the first canonical factor was 35.987%, indicating that, through χ_1 and η_1 , innovative teaching explained 35.987% of the total variance in professional role perceptions. Consequently, the dimensions of innovative teaching influenced the dimensions of professional role perceptions through the first canonical factors.

The second canonical factor (χ_2) of the X variables explained 14.3% ($\rho^2 = 0.143$) of the total variance in the second canonical factor (η_2) of Y variables and η_2 explained 12.136% of the total variance in the Y variables. The overlapping portion of the X and Y variables for the second canonical factor was 1.731%, indicating that, through χ_2 and η_2 , professional role perceptions explained 1.731% of the total variance in innovative teaching. Specifically, only professional services (0.586), professional organizations (-0.436), ideal thinking (0.409), and teaching resources (-0.628) yielded relatively high structural coefficients compared with the other variables. Therefore, the second canonical correlation predominantly verified the perception on the professional services and organizations influenced the ideal thinking and teaching resource dimensions of innovative teaching through the second canonical factor.

The third canonical factor (χ_3) of the X variables explained 5.9% ($\rho^2 = 0.059$) of the total variance in the third canonical factor (η_3) of the Y variables, and η_3 explained 8.546% of the total variance in the Y variables. The overlapping portion of the X and Y variables for the third canonical factor was 0.503%, indicating that, through χ_3 and η_3 , professional role perceptions explained 0.503% of the total variance in innovative teaching. Specifically, professional knowledge (0.463), professional organizations (0.470), ideal thinking (-0.308),

teaching methods (0.343), and diverse assessment (0.431) exhibited relatively high structural coefficients compared with the other variables. Consequently, the third canonical correlation primarily verified the effect of professional services and organizations on the ideal thinking, teaching methods, and diverse assessment dimensions of innovative teaching through the third canonical factor.

The fourth canonical factor (χ_4) of the X variables explained 2.5% ($\rho^2 = 0.025$) of the total variance in the fourth canonical factor (η_3) of the Y variables, and η_4 explained 5.366% of the total variance in the Y variables. The overlapping portion of the X and Y variables for the fourth canonical factor was 0.134%, indicating that, through χ_4 and η_4 , professional role perceptions explained 0.134% of the total variance in innovative teaching. Specifically, the dimensions of professional knowledge (0.505), professional organizations (0.306), and diverse assessment (0.329) exhibited relatively high structural coefficients compared with the other variables. Consequently, the third canonical correlation mainly verified the effect of professional knowledge and organizations on the diverse assessment dimension of innovative teaching through the fourth canonical factor.

Comprehensive discussions of the analyses

According to the results of the product-moment correlation analysis, the overall dimension of the professional role perceptions was moderately correlated with that of innovative teaching. Specifically, among all the dimensions of the professional role perceptions, professional development showed the highest correlation with innovative teaching.

The results of canonical correlation analysis revealed that four significant canonical correlations were observed among the dimensions of both professional role perception and innovative thinking. Through the first canonical correlation, the dimensions of professional role perceptions explained 43.544% of the total variance in the dimensions of innovative teaching, whereas the dimensions of innovative teaching explained 35.987% of the total variance in the dimensions of professional role perceptions. Although the other three canonical correlations exhibited statistical significance, each of them accounted for only 5% or less of the total variance. Specifically, χ_1 exhibited the highest and lowest correlation with professional development and organizations, respectively, whereas η_1 displayed the highest and lowest correlation with curriculum content and teaching resources, respectively. Consequently, these three correlations contributed little to explaining the relationship between the professional role perceptions and innovative teaching of the teachers.

In summary, the first canonical correlation showed that the professional role perceptions of the teachers displayed substantial explanatory power for explaining

teachers' innovative teaching. The results of the product-moment correlation and canonical correlation analysis both suggested that the teachers who perceived their professional development more favorably demonstrated a high performance of innovative teaching. Furthermore, teachers who effectively apply innovative curriculum content demonstrate satisfactory performance in their perception and behavior of innovative teaching. Chen and Fan (2007) asserted that because professional knowledge in education is constantly being updated, teachers should regularly assess their own professional ability and participate in in-service training to overcome subsequent challenges and apply innovation to their teaching. Teachers must play the roles of the developer, innovator, and learner. Through diversified professional development, teachers can periodically enhance their educational knowledge and capabilities to acquire the latest knowledge, thereby enabling them to readily overcome the challenges derived from a knowledge-based economy.

The predictability of teacher perceptions of professional role on innovative teaching

A collinearity test was conducted before performing multiple regression analysis. Hair et al. (2010) indicated that a multiple regression model can generate invalid results when collinearity exists in the data. A tolerance (TOL) of less than 0.10 and a variance inflation factor (VIF) of 10 or higher suggest a collinearity concern within the data. Table 5 shows that the TOL values of the predictor variables ranged from 0.434 to 0.682, whereas the VIF values ranged from 1.465 to 2.304, indicating that the presence of collinearity among the independent variables was not severe.

Predictability analysis

Table 5 indicates that all of the dimensions of professional role perceptions, including professional development ($F = 672.247$, $p < 0.001$), professional knowledge ($F = 383.922$, $p < 0.001$), professional ethics ($F = 271.052$, $p < 0.01$), professional organizations ($F = 211.194$, $p < 0.001$), and professional services ($F = 172.040$, $p < 0.05$), demonstrated statistically significant predictability for innovative teaching. The multiple correlation coefficient (R) was 0.782, suggesting that the dimensions of the professional role perceptions significantly predicted the dimensions of innovative teaching on an overall basis.

The total variance in innovative teaching explained by the predictor variables was 0.611, indicating that the dimensions of the professional role perceptions predicted 61.1% of the total explained variance in innovative teaching. Specifically, professional development showed the highest predictability and explained 54.9% of the total variance, followed by professional knowledge (3.3%),

ethics (1.4%), organizations (1.0%), and services (0.5%). The equation for the multiple regression model is presented as follows:

$$\text{Innovative Teaching} = 0.467 \times \text{professional development} + 0.168 \times \text{professional knowledge} + 0.115 \times \text{professional ethics} + 0.119 \times \text{professional organizations} + 0.086 \times \text{professional services}$$

The standardized coefficients (β) for the five predictor variables in the regression model were positive, indicating that their influence on innovative teaching is positive. High β values denote a high level of importance, meaning a high degree of influence. Table 5 show that the β values of professional development, knowledge, ethics, organizations, and services were 0.467, 0.168, 0.155, 0.119, and 0.086, respectively. Among these dimensions, professional development had the highest explanatory power for innovative teaching.

Comprehensive discussions of the predictability analysis

The multiple regression model shows that the five dimensions (professional development, knowledge, ethics, organizations, and services) of the professional role perceptions positively predicted innovative teaching and explained 61.1% of the total variance in innovative teaching. Specifically, the professional development exhibited the highest predictability. The results are consistent with those of Hsieh (2009), who indicated that the professional development of teachers predicted innovative teaching, and those of Hsieh (2008), who reported that the professional development of teachers positively affects teaching innovation.

In recent years, the Taiwanese government has endeavored to promote teacher professional development and policies regarding teacher evaluation; therefore, the professional development of teachers is deemed as the core value of teacher evaluations (Mercer, 2005). Chen and Fan (2007) proposed that the professional development of teachers is related to how teachers apply and share their knowledge, which enables them to formulate an innovative curriculum design, teaching strategies, and class management and subsequently formulate teaching methods, solve teaching problems, and improve the learning effectiveness of their students.

Therefore, professional development is an essential factor that shapes the professional role of teachers. By regularly participating in various advanced studies, teachers can increase their academic and educational knowledge to remain updated on the most recent information and motivate themselves to actively learn new materials and teaching methods. Through independent learning and peer interaction, teachers can create a learning environment and atmosphere suitable

for innovative teaching. In other words, teachers could continuously pursue professional development, actively further their education, and cultivate their professional knowledge to help define their professional role and improve their performance in implementing innovative teaching.

Conclusion

After the Teachers' Act and the Act of Governing the Appointment of Educators were introduced in 2012 in Taiwan, legal basis was provided for mandating elementary school teachers to renew their licenses through an evaluation and for implementing the teacher career ladder system. This law will serve as the gatekeeper for evaluating the competency of elementary school teachers in curriculum design, class management, research development, and professionalism to improve educational quality and ensure the professional development of the teachers.

Therefore, the purpose of the study was to explore the association between primary school teachers' perceptions of professional role and their innovative teaching in Central Taiwan.

The results gained in this study indicate that the elementary school teachers in Central Taiwan exhibited favorable perceptions of their professional role. Specifically, the teachers highly perceived professional services and professional ethics, whereas their level of perception for professional organizations was the lowest. That is, teachers have high regards for their professionalism and high role standards and expectations of themselves and other teachers.

Furthermore, the innovative teaching performance among teachers was favorable. Specifically, the teachers performed well in ideal thinking, but showed the lowest level of performance in utilizing teaching resources. That is, teachers exhibit an active and positive attitude when implementing innovative teaching.

On the other hand, the professional role perceptions of teachers, particularly the dimension of professional development, were significantly positively correlated with innovative teaching. The professional role perceptions, specifically the professional development dimension, effectively predicted innovative teaching.

Currently, the Taiwanese government has endeavored to promote teacher professional development and innovative teaching performance; therefore, the professional development and innovative teaching performance of teachers is deemed as the core value of teacher evaluations.

RECOMMENDATIONS

To enhance teachers' professionalism, the negative effects of professional organizations should be avoided

when promoting teacher professional development. According to the results of this study, the teachers perceived most of the dimensions of professional role favorably, except for professional organizations, which yielded a low mean value and high standard deviation. Although the education administration authority has continued to promote policies for evaluating teacher professional development, which substantially enhanced teachers' perception of their professional role, the teachers perceived the dimension of professional organizations differently. This indicates that the teachers and teacher organizations have yet to reach a consensus on various educational topics. Therefore, education administration authorities should continually promote professional evaluation through rational institutionalization, endeavor to cooperate with teacher professional organizations to reach a consensus, and engage in in-depth communications with teachers in Taiwan to resolve disputes. During this process, however, the authorities should avoid the negative effects that teacher professional organizations have about teachers' perception on their professions, in order to enhance the professionalism of teachers.

Teachers could join professional groups and attempt innovative teaching. In this study, the professional development of teachers effectively predicted innovative teaching. However, among the dimensions of professional role perceptions, professional organization achieved the lowest score, and professional development also obtained a score lower than that of other dimensions. Of the dimensions of innovative teaching, teaching resources also yielded the lowest score. Therefore, teachers should acknowledge how teaching methods and learning patterns are rapidly evolving in the current era wherein globalization, Internet usage, and information explosion are a common phenomenon. Instead of working alone, teachers could cooperate with others to apply innovation to teaching. Instead of confining themselves to a classroom, teachers could actively participate in professional educational groups, employ new resources and interact with people around them through activities such as curriculum design discussions, teaching demonstrations, reviews, and reflection. Thus, teachers can acquire novel concepts and ideas by sharing and exchanging their experience with others. Moreover, through repeated cycles of activities such as meetings, observations, self-reflection, and teaching revision, which enable teachers to feel less pressured about making progress and handling tedious affairs, teachers could focus on pursuing innovation in teaching, thus becoming innovative and excellent educators who are willing to attempt overcoming challenges ahead of them.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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