

The Development of School-Based Professional Learning Inventory (SPLI) Part II

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DOI: 10.6007/IJARBS/v7-i6/3029 URL: <http://dx.doi.org/10.6007/IJARBS/v7-i6/3029>

Abstract

The purpose of this article is to report the development, validity and reliability of School-based professional learning inventory (SPLI) that has been used to evaluate secondary teachers' perception toward school-based professional learning. The first phase of the study has been carried out through Exploratory Factor Analysis by using data from 166 trained teachers from 19 secondary schools in Batang Padang District, Perak. The Exploratory Factor Analysis through orthogonal rotation varimax method has shown twelve SPLI factors from three main constructs have been developed. The Cronbach Alpha of the overall items is .918. For the second phase of the study, the Confirmatory Factor Analysis has been carried out toward data of 372 trained teachers from 50 secondary schools in Malaysia. The purpose of this analysis is to support the factor structure developed from the first phase of the study. The Cronbach Alpha of the items is .94, meanwhile for each factor developed ranged from .70 to .92. As the conclusion, the result of Confirmatory Factor Analysis has supported the ten factors developed from the first phase of the study.

Keywords: Confirmatory Factor Analysis, Exploratory Factor Analysis, Reliability, School-based Professional Learning.

1. Introduction

Teaching is creative, complex and requires high skills. Hence, teachers must constantly deepen their knowledge and skills to remain effective throughout their careers. Teachers' knowledge and skills can be enhanced through the effective school-based professional learning. This is because teachers need to continually update their skills in line with changes to either the content knowledge or teaching and learning approaches (Abdul Kareem, 2010). Teachers who stop learning after the pre-service training will fail to fulfill their roles effectively and become 'prisoners of their own experiences' (Abdul Kareem & Khuan, 2005). Therefore, continuous professional learning is a must for every teacher.

Teachers' knowledge and skills can be enhanced through effective school-based professional learning. According to the literature Guskey (2000) ; Bredeson (2003) ; Zepeda

(2012) ; Poekert (2014) effective professional learning has the following elements; continuous, school-based and job-embedded, incorporates multiple data sources to plan, implement and evaluate professional practices as well as involves teachers and principals in identification and design of learning experiences to meet individual and collective needs. Thus, teachers will be more effective if professional learning activities have been planned and implemented in school effectively.

A study carried by previous researcher Kabilan and Mohamed (2009) in Malaysia found that professional learning opportunities were limited especially at schools level in catering teachers` learning needs as well as in enhancing teachers` practices. According to the study, school administrators should give serious attention to the teachers` commitment to improve their knowledge and skills throughout their careers. Furthermore, if various professional learning activities were held at the schools, it will give a better impact on teachers` practices. Thus, an effective school-based professional learning model which fit the Malaysian context should be identified so that teachers` will not have to learn as well as work in isolation.

Furthermore, there is still not many suitable instruments to measure secondary school teachers` perception toward school-based professional learning model. Most of the previous studies have been carried in Western countries such as Persico (2001) and the measurement is not really suitable with Malaysian context as well as less has been reviewed by previous researcher (Senin, 2005). Secondly, the use of suitable statistical procedure in developing and validating items. Dickey (1996) as well as Hair, Black, Babin, Andersen and Tatham (2010) argued that the exploratory factor analysis (EFA) itself cannot be used as a basis for a final determination regarding an underlying construct, because the analysis is designed to maximize the amount of variance within the current variable set, and subsequent analyses with other data sets may not reproduce the same factor structure.

Furthermore, EFA only focus on statistical and not according to the theory in determining the measurement structure scale as well as not enough to measure error (Henson & Capraro, 2001; Byrne, 2010). Given these various constraints and limitations of existing instrument reviewed, it was therefore necessary to develop an empirically validated school-based professional learning inventory (SPLI) specifically measuring perceptions, for use with Malaysian secondary school teachers. The use of EFA, confirmatory factor analysis (CFA), content validity as well as internal consistency are more suitable in developing and validating items (Mansor, Mat Norwani & Marzuki, 2011). Therefore, the purpose of this paper is to discuss the development, validity and reliability of school-based professional learning inventory that has been used to evaluate secondary teachers` perception toward school-based professional learning.

2. Inventory Development

This section reviews the literature to identify the relevant practices comprising school-based professional learning leaders` roles, professional learning models and teachers` practice in developing school-based professional learning inventory (SPLI).

2.1 Professional Learning Leaders` Roles

According to Lindstrom & Speck (2004) professional learning leaders` roles are concerned with certain roles that can lead to organizational culture changes which can create a professional learning community. Studies conducted by Senin (2005); Leithwood, Day, Sammons, Harris, and Hopkins (2006), and Wei, Darling-Hammond, Andree, Richardson, and Orphanos (2009) regarding teachers` perspective showed that school administrator roles have influenced the professional learning activities in school. Their findings show that there are positive relationship between administrators` leadership and teachers` learning. This showed that how important the school leaders role in enhancing school-based professional learning activities.

Regarding to previous literature, Lindstrom and Speck (2004) has identify four major leader roles which affect school-based professional learning: builder, designer, implementer and reflective leader, such roles have been adopted in related leader roles studies (Kose, 2009). Detailed was discussed below:

2.1.1 The school leader as builder

The role as builder emphasis on preparation of the school leader to improve the school capacity by using professional learning as the change agent in practices and school improvement. In addition, to achieve the vision of improved student achievement.

2.1.2 The school leader as designer

The role as designer was to plan the professional learning activities. It was essential for the leader to understand the effective professional learning components and made decision based on the school needs and context.

2.1.3 The school leader as implementer

The role as implementer is emphasis more on taking actions or making changes. School leader should know how and when to initiate the most appropriate changes as well as work in collaborative in focusing all actions to achieve desired goals.

2.1.4 The school leader as reflective leader

Reflective leader must model a continuous process of inquiry and reflection on actions. This role emphasis on making judgments based on data and feedbacks from the various source regarding actions taken to evaluate school development.

Thus, according to the above literature, professional learning leader roles can be classified into four dimensions as suggested by Lindstrom and Speck (2004) : builder, designer, implementer and reflective leader, which are used in our model.

2.2 Professional Learning Models

Professional learning is defined as the processes design to enhance teachers` knowledge, skills and attitudes either individually or collaboratively for the purpose of improving students` learning (Sparks, & Loucks-Horsley, 1989; Drago-Severson, 2004). Furthermore, according to Sparks and Loucks-Horsley (1989) professional learning is a planning and design of learning which embodies a set of assumptions about where knowledge about teaching practices come from and how the teacher acquire or extend their knowledge. Studies conducted by previous researcher Guskey (2005), OECD (2010), Zepeda (2012) and Swaffield and Alexandrou (2014) regarding teachers` perspective showed that there is relationship between professional learning model and teachers` practice. This showed that how important the professional learning models in enhancing teachers` practices.

Professional learning models must in different types of supports and challenges that aligned with teachers` need in order to engage effectively in the activities and grow from them Drago-Severson (2004) either through formal or informal experiences (Poekert, 2014). By creating various types of learning models, according to Killion (1999), will ignites and sustains teachers` excitement for “learning, growing and changing their practices”. Therefore, this study highlighted seven currently practiced professional learning models that have different features and functions to view teachers` perception about school-based professional learning in Malaysia. Five are from Model of Staff Development by Sparks and Loucks-Horsley (1989) and two models are from the Professional Learning Model by Roberts and Pruitt (2008). The models are:-

2.2.1 Individually-guided learning

Individually-Guided learning is learning designed by the teachers themselves and it is not necessarily occurred in formal settings. Teachers determine their own learning goals and choose activities they believed can achieve these goals, such as reading and writing professional academic journals or academic material.

2.2.2 Collaborative problem solving

Collaborative problem solving focused on a combination of learning styles as the result of the teacher involvement in systematic school improvement processes. For examples, curriculum planning, research on effective teaching and group problem-solving strategies. These activities can also be achieved through discussion, observation, training as well as trial and error method.

2.2.3 Teaching observation and assessment

Teaching can be monitored and analyzed objectively; this model relied primarily in pairs and is focused specifically on observations in others` classroom. The aim is to provide teachers with feedback on their performance. Moreover, collegial observations will enhance reflection and performance. The activities involve such as peer coaching, clinical supervision and teacher evaluation.

2.2.4 Training

Training is workshop-type sessions in which the presenter is the expert who established the course content based on a set of clear learning objectives through various group activities. This activities involved lectures, demonstrations, role playing, simulations and micro teaching. Effective training involved the exploration of theory, demonstration of skills, stimulating practice, feedback on performance and coaching in the workplace.

2.2.5 Action research

Action research is an activity of how teachers conduct mini-experiments to improved students` achievements and the findings of the experiments are shared among friends. Teachers learned the basic techniques of research in the classroom, formulate research questions, collect and analyze data and use the findings to improve teaching practices.

2.2.6 Study groups

Study group is a gathering of teachers who meet on a regular scheduled basis to discuss instructional issues that the group members have agreed to study. Learning outcomes of this group will be used as teaching strategies in the classroom. This activity will develop culture of collaboration among teachers, reflective discussion, sharing personal and teamwork practices that can improve teachers` commitment to the shared school vision and values.

2.2.7 Professional portfolios

Professional portfolio is a thoughtful document demonstrating a teacher`s approach to teaching. It shows teacher`s practice over time and reflection about it. The content of the portfolio is the goal or purposes targeted by teachers and it might consist of written documentation such as lesson plans. Portfolio is a powerful tool for reflection on practice which helped teachers to evaluate the decisions and actions taken.

According to the above literature, all these recently used professional learning models are included in our model.

2.3 Teachers` Practice

Teachers` practice is an evaluation of whether teachers used their new knowledge and skills on the job (Guskey, 2000). Studies conducted by previous researchers Rizvi (2008) and Kose (2009) regarding teachers` perspective showed that school administrator roles have influenced the teaching practices in school. The findings showed that there is relationship between administrator leadership and teachers` practice. This showed that how important the school leaders role in enhancing teachers` practice.

There were at least three major aspects of used or implementation need to be considered in changes of teachers` practice. According to the literature Hall and Hord (2011) this changes of practice can be evaluate through two aspects: stage of concern and level of use.

These two aspects have been derived from the Concerns-Based Adoption Model of change (CBAM). Therefore, the previous researchers Guskey (2000) and Adey (2007) have proposed teachers' practice is measured on three aspects: concern, level of use and differences in practice as discussed below.

2.3.1 Concern

Concern refers to the extent teachers become more familiar with the change and more comfortable with related practices and consequences.

2.3.2 Usage of knowledge and skills

Usage of knowledge and skills refers to the extent teachers' actions or non-actions regarding the use of newly acquired knowledge and skills.

2.3.3 Differences in practice

Differences in practice refer to the extent teachers practices were different from what has been used in the past or in the present time.

Thus, according to the above literature, teachers' practice can be classified into three dimension as suggested by the previous researchers Guskey (2000) and Adey (2007): concern, usage of knowledge and skills and differences in practice, which are used in our model.

3. Methodology and Results

This section will discuss about questionnaire design, sampling procedure, factor analyses, validity and reliability.

3.1 Questionnaire Design

The questionnaire is composed of three parts including: professional learning leaders' roles (PLLR), professional learning models (PLM), and teachers' practice (TP). The questionnaire items were answered using a four-point scale anchoring at 1, 2, 3, and 4 (strongly disagree, disagree, agree, strongly agree). According to Babbie (2007) this scale is suitable to measures teachers' attitudes as well as opinions. Furthermore, this four-point scale without central tendency, is suitable to use in East Asian respondents, where the 'doctrine of mean' is advocated in the culture (Cohen, Manion & Morrison, 2007). Detailed definitions of the dimensions are described below:

3.1.1 Professional learning leaders' roles.

The instrument used has been adopted from Lindstrom and Speck (2004) and Speck and Knipe (2005). Based on the literature review Lindstrom and Speck (2004), Speck and Knipe (2005) and

Kose (2009), the four major constructs were considered, namely builder, designer, implementer, and reflective leader.

3.1.2 Professional learning models.

The instrument used has been adopted from the previous researcher such as Persico (2001), Senin (2005), Roberts and Pruitt (2008) and Murphy, and Lick (2005). Based on the literature review of Sparks and Susan Loucks-Horsley (1989), Guskey (2000), Zepeda (2012) and Roberts and Pruitt (2008) seven most frequently used teachers` professional learning models are extracted and considered in this study, namely individually-guided, observation and assessment, involvement in improvement process, training, action research, professional portfolios and study groups.

3.1.3 Teachers` practice.

The instrument used has been adopted from previous study Hall and Hord (2011) for concern and usage of knowledge and skills dimensions. Meanwhile for change in practices` dimension, it is adopted from Guskey (2000).

3.2 Sampling

The data used in this research consists of 2 batches of questionnaires responses from participants in 60 regular secondary schools in Malaysia. There are two phase of data collections. First set of data was obtained from 19 regular secondary schools in Batang Padang district in Perak, Malaysia. This set of data was used in preliminary study as to perform exploratory factor analysis. 10 sets of questionnaires were distributed to each of these 19 regular secondary schools. A total of 190 survey forms were circulated, of which 170 surveys were return and 166 were valid for analysis.

While, the second batch of data was obtained from 41 regular secondary schools in Malaysia. A multistage cluster sampling technique has been used in this phase of data collection. This set of data was used to perform confirmatory factor analysis. The number of the population is 146,513, it was expected that the sample would compromise 384 teachers from 41 schools (Cohen, Manion & Morrison, 2007). A total of 410 survey forms were circulated, 10 forms for each school. The 380 surveys were return and 372 were valid for analysis (Mansor, Mat Norwani & Yunus, 2010).

3.3 Factor analyses, validity test and reliability

The Cronbach Alpha coefficients were used to measures the internal consistency of these scales Nunnally & Bernstein (1994). In this study, the constructs which had Cronbach Alpha coefficients greater than .70 have been retained for further analysis (Hair, Black, Babin, Andersen & Tatham, 2010). Furthermore, measures with item-to-total correlation larger than 0.3 are considered to have criterion validity (Hair et. al, 2010). The item-to-total correlation of

each measure was more than .3, we consider the criterion validity of each scale to be satisfactory.

The original questionnaire was translated into Malay language twice by experts using the `back technique`. The items are reviewed by a panel of Sultan Idris Education University lecturers to ensure the translation of meaning and terminology met the theoretical background as the technique was recommended by Sireci, Yang, Harter, and Ehrlich (2006). The panel consist of an assessment and measurement expert and two human resource development experts (Mansor, Mat Norwani & Yunus, 2010; Mansor, 2013).

Then, the questionnaires have been administered to six trained teachers to identify if there were any confusion regarding the items and record it in the space provided for improvements or been dropped out (Johnson & Christensen, 2008; Flowers, 2006). The purpose was to improve the items and to ensure it was suitable for Malaysian context. Furthermore, it was important to get feedback on quality of the questionnaire as it was easy to understand and used the appropriate language (Mansor, Mat Norwani & Marzuki, 2001). The samples were asked to evaluate about the clarity of each items by using the scale given (Flowers, 2006). A scale of 1 to 10 is used to determine the validity coefficient for each item. According to Tuckman and Waheed in Noah and Ahmad (2005) if the total of the score obtained from the experts is 70% or above, it means that the item has a high score for the content validity aspect. Otherwise the item will be dropped from the questionnaires (Mansor & Baharom, 2014). The results of content validity are presented in Table 1 below.

Table 1: Content validity scores

Panel	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Cumulative Score
Professional Learning Leaders` Roles	92.72	91.51	88.48	82.42	82.42	80.00	86.25
Professional Learning Models	89.72	87.51	85.46	80.40	82.43	81.00	85.57
Teachers` Practice	91.51	92.72	88.40	82.50	83.06	80.00	86.64

Meanwhile, to ensure the instrument has reasonable construct validity, both exploratory and confirmatory factor analyses were used. The exploratory factor analysis (EFA) through orthogonal rotation with varimax method had been used. The EFA applied the following rules as suggested by literature (Hair et al, 2010; Tabachnick & Fidell 2007):

- i. Bartlett's Test of Sphericity had to be significant ($p < .05$);

- ii. Kaiser-Meyer-Olkin measure of sampling index $\geq .5$;
- iii. Eigenvalue > 1 ;
- iv. Items with the factor loading $> .5$ were retained;
- v. Factors building were based on school-based professional learning theory and previous studies.

The results of exploratory factor analysis are presented in Table 2. Two constructs have been excluded after the analysis, namely observation and assessment and involvement in improvement process.

Table 2: Exploratory factor analysis and internal consistency values for the questionnaires

Construct	Factor	Number of item per construct	Percentage of variance	Cumulative percentage	Cronbach's α
SPLI		52			.92
Professional Learning Leaders` Roles	Builder	3	9.70	55.61	.83
	Designer	5	16.13		.64
	Implementer	6	16.86		.78
	Reflective leader	5	12.62		.73
Professional Learning Models	Individually-guided learning	4	8.76	64.82	.63
	Training	6	12.86		.79
	Action research	5	12.15		.82
	Professional portfolios	4	13.16		.85
	Study groups	5	17.88		.94
Teachers` Practice	Concern	3	15.80	54.54	.71
	Usage of skills and knowledge	3	17.97		.82
	Differences in practices	3	20.77		.82

Source: Mansor and Baharom (2014)

The confirmatory factor analysis was used test the existence of unidimensionality and stability of factor from the three constructs, forty-three item SPLI using AMOS Version 21. For further analysis, the construct which Cronbach's α is more than .70 has been retained. The constructs that has been excluded are Designer form Professional Learning Leaders Role and Individually-guided learning from Professional Learning Models. The parameters were estimated using maximum likelihood (Mansor, Mat Norwani & Marzuki, 2001; Mansor & Baharom, 2014). We analyzed this hypothesized three-main construct model with all ten factors, forty-three items as indicators of the variable. This approach incorporates both

observed and latent variables. Multiple indices provided a comprehensive evaluation of model fit (Hu & Bentler, 1999). We examined chi-square per degree of freedom ratio (χ^2/df), Comparative Fit Index (CFI), Incremental Fit Index (IFI) and Root Mean Square Error of Approximation (RMSEA). These indices were used to evaluate the goodness-of-fit of the model that fit the data. However, given the known dependency of the chi-squared index depends on sample size Byrne (2010) and Schumacker and Lomax (2010) it is less suitable to use in determining the fitness of the model (Iacobucci, 2010). Therefore, indices such as CFI and IFI were also being evaluated. χ^2/df ratio value of less than 3 and value of .90 for CFI and IFI have been use as a lower cutoff value of the acceptable fit (Nunnally & Bernstein, 1994; Schumacker & Lomax, 2010). In addition, the RMSEA value of less than .06 indicate a good fit, while the value as high as .80 indicate a reasonable fit (Hu & Bentler, 1999). The results of the each CFA model as well as pooled items model are presented in Table 3 below.

Table 3: Summary of fit indices and internal consistency value

Model	χ^2/df	CFI	IFI	RMSEA	Cronbach's α
Hypothesized three-factor Professional Learning Leaders` Roles model	2.45	.98	.96	.06	.94
Hypothesized four-factor Professional Learning model	2.42	.85	.85	.06	.89
Hypothesized three-factor Teachers` Practice model	2.68	.96	.96	.06	.84
Hypothesized three-factor SPLI model	2.45	.92	.98	.06	.91

The analytical results of the AMOS CFA model reveal a satisfactory fit for our sample data. The modified hypothesized three-factor SPLI model with ten-construct is illustrated in Fig. 1 below. The fit indices ($\chi^2/df = 2.45$, CFI = .98, IFI = .98, GFI = .96, and RMSEA = .06) indicates the CFA model meets recommended levels. Thus represents a satisfactory fit for the sample data collected. The χ^2/df ratio also indicates a reasonable fit at 0.06. As the conclusion, the proposed model shows the existence of unidimensionality of each factor and stability of the forty-three items SPLI. The Cronbach's α of overall SPLI items is .94, meanwhile internal consistency values for each factor are shown in Table 4.

Table 4: Internal consistency values for the SPLI

Construct	Factor	Number of item	Cronbach's α
Professional Learning Leaders` Roles		14	.91
	Builder	3	.83
	Implementer	6	.75
	Reflective leader	5	.78
Professional Learning Models		20	.89
	Study groups	5	.92
	Professional portfolios	4	.84
	Training	6	.74
	Action Research	5	.74
Teachers` Practice		9	.84
	Concern	3	.74
	Usage of skills and knowledge	3	.70
	Differences in practices	3	.72

Source: Mansor (2013)

The comparison of the internal consistency values between studies for six factors, namely individually-guided learning, training, action research, concern, usage of skills and knowledge as well as differences in practices has been done. Overall, the internal consistency values for these construct is presented in Table 5. The internal consistency values for these constructs are better compared to the previous studied after been reviewed.

Table 5 Comparison of internal consistency values between studies

Construct	Cronbach's α			
	Preliminary Study	Actual Study	Persico 2000	Senin 2005
Individually Guided Learning	.629	.633	.634	.628
Training	.803	.744	.602	.613
Action Research	.818	.740	.632	.786
Concern	.710	.740	-	.700
Usage of skills and knowledge	.819	.700	-	.690
Differences in practices	.815	.720	-	.710

4. Summary and Discussions

The purpose of this study is to develop and validate school-based professional learning inventory (SPLI) used to measure secondary teachers' perception in Malaysian setting. This study is based on school-based professional learning theory and used statistical approach to identify 52 items in developing SPLI. Results from these two phases of study suggested that SPLI and its constructs shown the good internal consistency values compared to previous research as to measure teachers' perception toward school-based professional learning model. The overall internal consistency value is .940, meanwhile the values of each constructs range from .663 to .915. Therefore, these items are suitable to use in general research.

This study has a few weakness, such as the comparison of the values of internal consistency among the studies cannot be done because less of reviewed inventory. Secondly, the sample only consisted of secondary schools teachers, therefore the next study should be extended to primary school teachers. Further study also should be explored on the perception of the teachers on the existence of other professional learning models. However, hopefully the findings are valuable for the researchers, school-based professional learning developers' and teacher educator's references, who are interested more in exploring school-based professional learning further. Furthermore, the inventory can be tested and used to developed professional learning model according to the context.

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