

## **SCHOOL-BASED PROFESSIONAL LEARNING INVENTORY (SPLI): INVENTORY DEVELOPMENT, FACTOR ANALYSIS, VALIDITY AND RELIABILITY**

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### **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 41 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 .940, meanwhile for each factor developed ranged from .663 to .915. As the conclusion, the result of Confirmatory Factor Analysis has supported the existing twelve factors developed the first phase of the study.

**Keywords:** Exploratory Factor Analysis, Confirmatory Factor Analysis, 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 (Omar Abdull Kareem & Khuan Wai Bing, 2005). Teachers who stop learning after the pre-service training will fail to fulfill their roles effectively and become 'prisoners of their own experiences' (Omar Abdull Kareem, 2010). 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 Guskey (2000), Bredeson (2003) and Zepeda (2008) 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 Muhammad Kamarul Kabilan Abdulah and Abdul Rashid Kamarul (2009) in Malaysia found that professional learning opportunities were limited either carried out by MOE, State Education Departments (SEDs), District Education Offices (DEOs) or at schools level. According to them, 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 work as well as learn in isolation.

However, there is still not many suitable instrument 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 (2000) and the measurement is not really suitable with Malaysian context as well

as less has been reviewed by researcher such as Amin Senin (2005). Secondly, is the use of suitable statistical procedure in developing and validating items. The use of EFA, confirmatory factor analysis (CFA), content validity as well as internal consistency are more suitable in developing and validating items (Ang & Huan, 2006; Mahaliza Mansor, Norlia Mat Norwani & Shahril @ Charil Marzuki, 2011). Therefore, the purpose of this paper is to discuss the development, validity and reliability of SPLI that has been used to evaluate secondary teachers' perception toward school-based professional learning.

## 1.1 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).

### 1.1.1 Professional Learning Leaders' Roles

According to Lindstrom and 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 Amin 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 administrator leadership and teachers' learning. This showed that how important the school leaders role in enhancing school-based professional learning activities.

Lindstrom and Speck (2004) 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 such as Kose (2010). Detailed was discussed below:

#### i. The school leader as builder

This role 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.

#### ii. 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.

#### iii. 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.

#### iv. 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.

### 1.1.2 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 Guskey (1986; 2005), Blank, de las Alas and Smith (2008), and OECD (2010) regarding teachers' perspective showed that there was 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. Creating various types of learning models, Killion (1999) discovered, 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 (Sparks & Loucks-Horsley, 1989) and two models are from the Professional Learning Model by Roberts and Pruitt (Roberts & Pruitt, 2009). The models are:

i. Individually-guided learning

Individually-Guided learning is learning designed by the teachers themselves and it is not necessarily occurred in a 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.

ii. 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.

iii. Teaching observation and assessment

Teaching can be monitored and analysed 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.

iv. 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.

v. 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.

vi. Study groups

Study groups 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.

vii. 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.

**1.1.3 Teachers` practice**

Teachers` practice is an evaluation of whether teachers used their new knowledge and skills on the job

(Guskey, 2000). Studies conducted by Meher 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 Hall and Hord (2010) 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). While, Guskey (2000) and Adey (2005) proposed teachers' practice is measured on three aspects: concern, level of use and differences in practice.

i. Concern

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

ii. 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.

iii. Differences in practice

Differences in practice refers 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 Guskey (2000) and Adey (2004): concern, usage of knowledge and skills and differences in practice, which are used in our model.

## 1.2 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 Likert 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:

i. 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 & Speck, 2004; Speck & Knipe, 2005; Kose, 2009), four major constructs were considered, namely builder, designer, implementer, reflective leader.

ii. Professional learning models.

The instrument used has been adopted from Persico (2000) and Amin Senin (2005) with the consent from the previous researcher through e-mail, Roberts and Pruitt (2009) and Murphy and Lick (2005). Based on the literature review (Sparks & Loucks-Horsley, 1989; Guskey, 2000; Zepeda, 2007; Roberts & Pruitt, 2009) 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.

iii. Teachers' practice.

The instrument used has been adopted from Hall and Hord (2010) for concern and usage of knowledge and skills dimensions. While for change in practices' dimension, it is adopted from Guskey (2000).

## 2 FACTOR ANALYSES VALIDITY AND RELIABILITY

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

### 2.1 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. 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 (Mahaliza Mansor & Norlia Mat Norwani, 2010).

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 (KPM, 2009), it was expected that the sample would compromise 384 teachers (Cohen, Manion & Morrison, 2007) from 41 schools. A total of 410 survey forms were circulated, 10 forms for each school. The 380 surveys were return and 372 were valid for analysis (Mahaliza Mansor, Norlia Mat Norwani & Jamal @ Nordin Yunus, 2011).

## 2.2 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, Anderson & Tatham, 2010; Hancock & Muller, 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' (Mahaliza Mansor, Norlia Mat Norwani & Jamal @ Nordin Yunus 2010). 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). A scale of 1 to 10 is used to determine the validity coefficient for each item. According to Tuckman and Waheed (1981) in Sidek Mohd Noah and Jamaludin 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 (Mahaliza Mansor, Norlia Mat Norwani & Shahril @ Charil Marzuki, 2011). 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
Percentage (%)	92.72	91.51	88.48	82.42	82.42	80.00	86.84

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 Hair et al. [2010] and Tabachnick and 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	Cumulative percentage	Cronbach's $\alpha$
PLLR(PPS)	Builder (mbina)	3	55.61	.828
	Designer (mreka)	5		.642
	Implementer (mlaksana)	6		.781
	Reflective leader (mpreflek)	5		.725
PLM(MPPS)	Individually-guided learning (mpk)	4	64.82	.630
	Training (mlat)	6		.795
	Action research (mkt)	5		.822
	Professional portfolios (mpp)	4		.847
	Study groups (mkp)	5		.944
TP(AG)	Concern (mpri)	3	54.54	.710
	Usage of skills and knowledge (mguna)	3		.819
	Differences in practices (mbeza)	3		.815

Source: Mahaliza Mansor (2013)

The confirmatory factor analysis was used test the existence of unidimensionality and stability of factor from the three constructs, fifty two item SPLI using AMOS Version 18 [Arbuckle, 2009]. We analyzed this hypothesized three-construct model with all ten factors as indicators of the variable. The parameters were estimated using maximum likelihood (Mahaliza Mansor et al, 2011). 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 ( $\chi^2/df$ ), Comparative Fit Index (CFI), (IFI), Goodness of Fit Index (GFI) 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 (Bryne, 2010; Schumacker & Lomax, 2004).  $\chi^2/df$  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, 2004). 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 individual questionnaires items were composited into specific factor groups. For further analysis, the construct which Cronbach's  $\alpha$  is more than .70 has been retained. The constructs that has been rejected are Designer form PLLR and Individually-guided learning from PLM. The results of confirmatory factor analysis of three-constuct model are presented in Table 3 below.

Table 3: Summary of fit indices from confirmatory factor analysis and internal consistency value

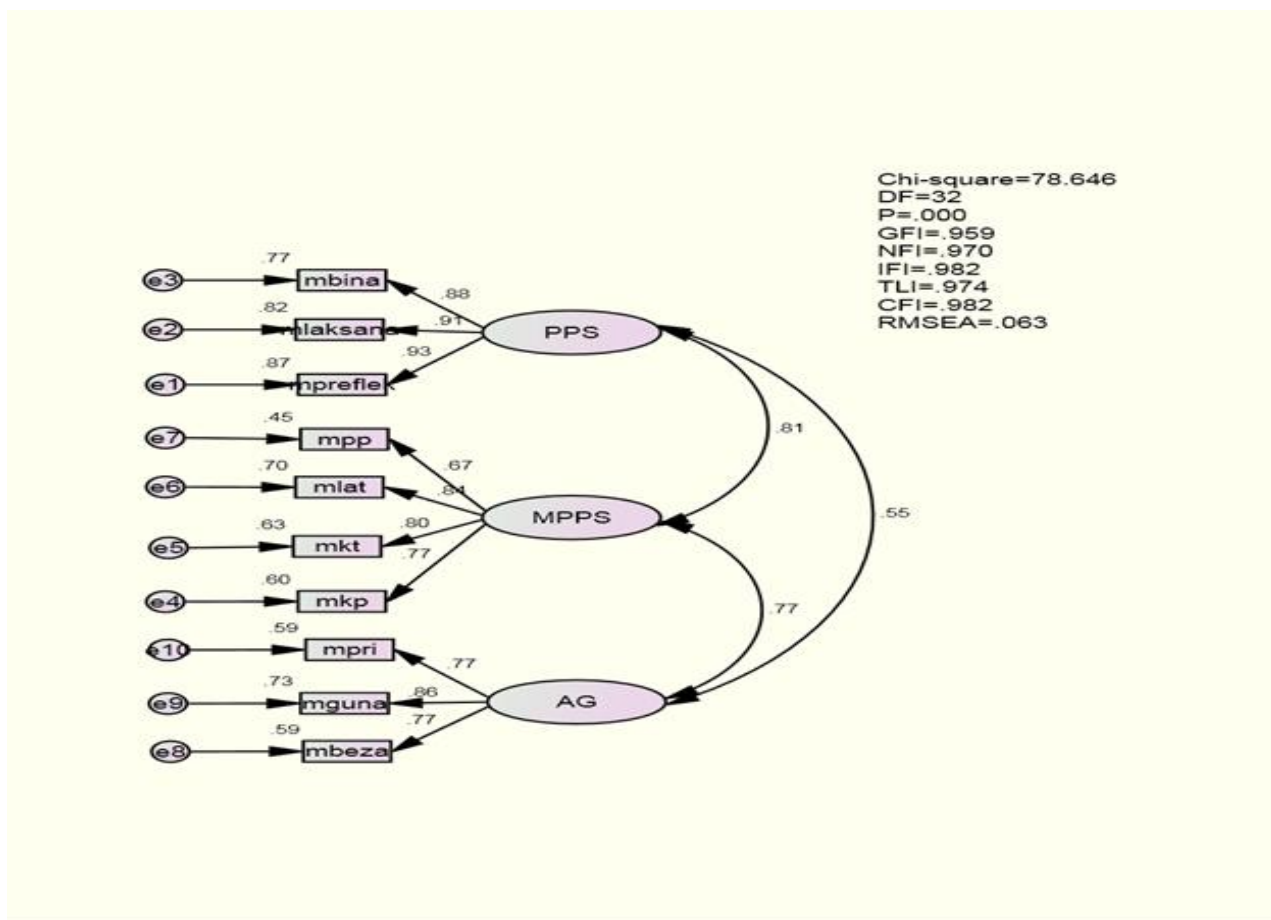
Model	$\chi^2/df$	CFI	IFI	RMSEA	Cronbach's $\alpha$
Hypothesized three-factor model	2.45	.98	.98	.06	.94

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 Figure 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  $\chi^2/df$  ratio also indicates a reasonable fit at .06. As the conclusion, the proposed model shows the existence of unidimensionality of each factor and stability of the 33 items SPLI. The indices of the fit test of the overall CFA model are shown in Figure 1. The Cronbach's  $\alpha$  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 $\alpha$
PLLR(PPS)		14	.91
	Builder (mbina)	3	.83
	Implementer (mlaksana)	6	.75
	Reflective leader (mpreflek)	5	.78
PLM(MPPS)		20	.89
	Study groups (mkp)	5	.92
	Professional portfolios (mpp)	4	.84
	Training (mlat)	6	.74
	Action Research (mkt)	5	.74
TP(AG)		9	.84
	Concern (mpri)	3	.74
	Usage of skills and knowledge (mguna)	3	.70
	Differences in practices (mbeza)	3	.72

Source: Mahaliza Mansor (2013)



Sources: Mahaliza Mansor (2013)

Figure 1 Confirmatory Factor Analysis Model of SPLI

The comparison of 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 constructs in Persico (2000) and Amin (2005) are in Table 4. The internal consistency values for these constructs are better compared to the previous studied after been reviewed.

Table 4 Comparison of internal consistency values between studies

Construct	Cronbach's $\alpha$			
	Preliminary Study	Actual Study	Persico (2000)	Amin (2005)
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

### 3 SUMMARY AND DISCUSSION

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 leaning theory and used statistical approach to identify 33 items in developing SPLI. Results from this two phases of study suggested that SPLI and its constructs shown the good internal consistency values 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 (Nunnally & Bernstein, 1994).

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 school, therefore the next study should be extended to primary school teachers. Further study also should be explore 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 educators references, who are interested more in exploring school-based professional learning.

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