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## Validation of the Malaysian Version of the Teacher Education Program Coherence Questionnaire

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*Abstract: The main purpose of this study was to validate a Malay Language version of a 30-item teacher education program coherence questionnaire. Two different samples of preservice teachers completed the Malay translation of the questionnaire. Exploratory factor analysis (N=220) showed four types of perceived program coherence which had good internal consistency ranging from 0.79 to 0.86: 'Opportunity to enact practice', 'Opportunity to analyze practice', 'Opportunity to connect ideas across courses' and 'Coherence between courses and practical experience'. The confirmatory factor analysis (N= 234) provided support for a four-factor model. In addition, an analysis of criterion validity of the four types of perceived program coherence also indicated meaningful relationships to teaching efficacy. Our study supports the applicability of the Malaysian teacher education program coherence questionnaire for use among Malaysian preservice teachers. Both theoretical and practical implications are provided for teacher educators and researchers.*

### Introduction

Conventional teacher education is rightly the place for acquiring knowledge and skills necessary in a teacher preparation program, however, "it can be accused of being stagnant and being inept to produce teachers who are capable of moving beyond basic competence (knowledge and skills) towards teachers who are creative and who are relevant to the real problems of classroom practices" (Goh & Blake, 2014, p. 477). Similarly, Forzani (2014), and Zeichner (2014) have long expressed that new teachers struggle to apply theory learnt at the university to actual classroom practices. However, "the perennial challenges of integrating theory with practice faced by existing teacher education models suggest a change in thinking about the structure and focus of preservice practica" (Moore, 2003, p. 41). Teacher education needs to coherently integrate relevant aspects of the preservice teachers' program with a more realistic and practical view of teaching and learning about real world knowledge and skills (Hammerness & Klette, 2015). Researchers in teacher education have contended that there is and should be a strong connection between theory and practice within teacher education programs (e.g. Forzani, 2014; Kennedy, 2016; Russell, McPherson & Martin, 2001).

Similarly and recently in Malaysia, the Malaysia Education Blueprint 2013-2025 have highlighted the need for quality teaching which was further supported by a government review for an improved preservice teacher development (see review in High-performing education, 2013). The reviews hinted that despite preservice teachers being prepared on

pedagogical methods of teaching, their ability to connect theory to practice might still be impeded by traditional skill based transmission models of teacher education. Laments that new teachers have difficulty applying pedagogical theory learnt in the university to actual classroom practice are not new. Newspapers and tabloids have unfortunately reinforced a belief that current new teachers are failing to equip pupils with the knowledge and skills required for successful participation in the globalized world (Lim, 2012; World bank: Worsening obstacle to Malaysia' high income hopes, 2013). Increasingly, various reforms have been debated and prompted, sometimes presumptuously made, about whether and how teacher preparation influenced teacher's competency and effectiveness, especially their ability to improve student learning. Ahmad Jazimin, Intan Safinas, Mohd Razali, Mohd Hasan, Ong and Bushro (2015) and Somekh, Chang and Noor Aini (2011) found in their respective studies that preservice teachers were taught to be equipped with new 21<sup>st</sup> century skills to be ready for the classrooms of today. However, their research implied that preservice teachers, being new to the teacher learning environment, often-times missed the point of a lesson or a concept because not enough time or opportunity had been given to these teachers to practice it and then another lesson was introduced. Although there were some attempts to improve teacher preparation, Goh and Blake (2014a) argued that, many have not been successful at the tasks. There is, to our best knowledge, no work done or published as yet to better understand or appreciate how teacher education in Malaysia coherently integrate the complexities of a teachers' work.

There is little avenue for teacher education to evaluate whether professional preparation courses provide integration of theory and practices (Hammerness & Klette, 2015). Hammerness and Klette (2015) contend that preservice teachers' ability to coherently manage what they have learnt in a university setting and the application of best teaching practices is crucial. Coherence in integrating theory and practice becomes a 'prerequisite' for high quality teaching in classroom settings (Cabaroglu, 2014; Hammerness, 2006). A clear need exists for a validated instrument for use in assessing whether a teacher education program provides coherence to assist preservice teachers' competency in integrating these two important elements in teaching. A more systematic assessment of coherence in teacher education is considered to be an important research area (Hammerness & Klette, 2015).

In 2012, a university in Norway initiated the Coherence and Assignments in Teacher Education (CATE) project which saw the development of a new instrument to evaluate the existence of coherence within the teacher education program (Hammerness & Klette, 2015). The study associated with this project was the first Nordic survey of preservice teachers' ability to coherently integrate theory and practice in teaching (Hammerness, 2013). The study showed that opportunities to enact practice (such as analyzing student work, planning for teaching, and discussion of teaching experiences) as well as a perception of connection to the real world of teaching, measured using a program coherence questionnaire developed during the CATE project promoted preservice teachers' teaching practice competencies. It would seem opportune that such instrument has now become available as it has become increasingly important for both improvement and even survival of teacher preparation that productive methods to evaluate the 'theory-into-practice' view of preservice teacher preparation to assist Malaysian teacher educators, administrators in their assessment of their teacher education (Goh & Matthews, 2011; Goh & Wong, 2014). However, as far as we are aware, the applicability and suitability of the program coherence instrument, outside of its use in the Nordic countries, have not been examined especially in the Asian context and more specifically in Malaysia.

It is probably not unreasonable to assume that the questionnaire developed in Norway might not work in the expected manner when used in an Asian setting. Therefore, in the present study, we explore the validity of the program coherence questionnaire among groups

of preservice teachers in Malaysia by examining the factor structure underlying the items within the questionnaire identified as tapping teacher education program coherence. To accomplish this, we use both exploratory and confirmatory approaches using two different sets of preservice teachers' data. The exploratory analysis helps to uncover the underlying structure, gauge the reliability of its factors and to identify the underlying associations between these factors. A confirmatory factor analysis is then used to test the proposed model identified from the exploratory approach using a second data set. Several models are also included as alternative models (Rindskopf & Rose, 1988). As a final construct validation, we also explored possible differential relationships between the factors obtained with a set of theoretically relevant measure.

### **Program Coherence**

The discussion about 'coherence in program' has been ongoing since the 1990s. What is understood then about coherence in a curriculum is one which have "direction, systematic relations, and intelligible meaning, thus conveying a sense of purpose, order, and intellectual as well as practical control" (Buchman & Floden, 1991, p. 4). Such curricula is not a constricted 'one size fits all'. It must provide avenue for preservice teachers to align new ideas or unexpected experiences in the classroom. Tatto (1996) suggests that a coherent program should be one that have: "... shared understandings among faculty and in the manner in which opportunities to learn have been arranged (organizationally, logistically) to achieve a common goal – that of educating professional teachers with the knowledge, skills, and dispositions necessary to more effectively teach diverse students" (p. 176). More recently, Zundans-Fraser and Bain (2016) reiterated that creating a coherent teacher education requires all faculties, together with the university administration, to endeavor to identify a central focus for teacher learning. It should be a collective responsibility to influence policies and practice.

The term 'shared vision' was succinctly used by Grossman, Hammerness, McDonald, and Ronfeldt (2008) in which courses and practical experiences within the teacher education program should reflect and support deeper understanding and thinking about such a vision and should therefore be organized as such. Despite earlier definitions, 'coherence' is still not easily clarified. Hammerness (2006) emphasizes coherence as a cyclical process that constantly requires adjustments and calibration. Similarly, Nixon (1991) asserts that "... a curriculum cannot be made to cohere as it should be perceived as a process and not as a product" (p.188). It is probably Muller (2009) who forwarded a practical definition to explain coherence in curricula by differentiating it into 'conceptual coherence' and 'contextual coherence'. Conceptual coherence refers to courses which are prerequisites to the next course. Without the earlier courses, preservice teachers will not be able to understand the later courses. Contextual coherence is the alignment of courses to practical or clinical experiences.

Hammerness and Klette (2015) maintain that a coherent teaching program can influence how preservice teachers link theory to practice. There must be an orientation to view teaching as structured, meaningful but coherent. There is integration of the knowledge obtained by the preservice teachers across their work. It aligns with the goals that should be set out by the teaching curricula - a shared vision of good teaching between faculty staff and students (Hammerness & Klette, 2015), links theory to practice, and the ultimate goal - the extent to which preservice teachers feel confident to carry out the practical aspects of a teachers' work in the classroom (McArdle, 2010). A program that is coherent must "inform program design, curriculum and pedagogy, and shape what and how new teachers learn"

(Hammerness & Klette, 2015, p.7). Preservice teachers must be able to see the purpose and connectedness of what they are learning (McArdle, 2010). To allow this to happen, preservice teachers are given the opportunity to critically examine the purposes of teaching and to enact practice. This allows them to see and reconcile theory and practice of learning through making and examining the interdependence of the different elements within the teacher education program (Canrinus, Bergem, Klette & Hammerness, 2015; Hammerness, 2013).

Understanding the different typologies of program coherence and work by Muller's (2009) description of coherence, Hammerness (2006) conceptualized two distinct forms of program coherence. First, the conceptual coherence refers to the organization of the content of a program towards providing alignment between theory and practice. Structural coherence, on the other hand, refers to building a program that provides an integrated learning experience for preservice teachers which aligns university courses with their practicum. Canrinus, Bergem, Klette and Hammerness (2015) succinctly summarize program coherence "as a process, in which all courses within a program, be it theoretical or practical, are aligned based on a clear visions of good teaching" (p.3). Program coherence is also "established through coherence between university courses ... and field experiences ... and includes student teachers' opportunities to make connections across ideas and to build their own understanding as features of program coherence" (p.3). The CATE project sets out to better understand whether a program which allows preservice teachers the opportunity to create new knowledge from existing knowledge base and to integrate what they have learnt can be qualified as coherent (Canrinus, Bergem, Klette & Hammerness, 2015). The premise of the project lies in the need to understand whether preservice teachers are able to apply, integrate or modify their new knowledge into their field experiences (Hammerness & Klette, 2015). The project which originated in Norway focuses on the teachers' doing and describes the teachers' practical ability (Hammerness, 2013). However, in teacher preparation, it is often difficult to appraise the bridge between how preservice teachers are prepared for knowledge acquisition and use during their times in the university and then followed by the application in the actual classroom. Therefore, a teacher education program coherence questionnaire to capture the opportunities as perceived by the preservice teachers to transfer knowledge from the teacher education preparation into the field classroom was developed as one of the objective of the project. It is this questionnaire that the present study is interested to validate for use among Malaysian preservice teachers.

### **The Teacher Education Program Coherence Questionnaire**

The teacher education program coherence questionnaire consisted of two hypothesized dimensions and 38 items. The first dimension had 19 items and evaluated whether the teacher education program provided opportunities for preservice teachers to practice teaching or to enact practice. Items in this dimension asked preservice teachers about their opportunities to practice activities that were very close to the real work of teaching such as to study subject curriculum, analyze pupils' school work, view videos of classroom teaching, investigate materials related to classroom practices and to analyze their own learning (Hammerness & Klette, 2015). The second dimension consisted of another 19 items that assessed coherence across courses. Items were designed to look at whether the program enabled the preservice teachers to make explicit connections between campus courses and the practicum (Canrinus, Bergem, Klette & Hammerness, 2015). Overall, the questionnaire attempted to examine both the conceptual coherence and contextual coherence (or structural coherence) as depicted by Muller (2009) and Hammerness (2006). The items from opportunities to enact practice were rated on a four-point options (1=none – 4=extensive

opportunity) while the items to assess coherence were also rated on a four-point scale (1=strongly disagree – 4=strongly agree).

As the 38-item questionnaire is relatively new, at the time of this writing, no study has yet been published regarding the psychometric properties of the hypothesized dimensions of the 38 items. Canrinus, Bergem, Klette and Hammerness (2015), for the purpose of their study, validated 19 items from the second dimension and found that the total variance explained by their factors amounted to 54.19%. We feel that the 38 items also merit investigation because, as a complete set, it can provide a measure to evaluate the ‘theory-into-practice’ view of teacher education such as possible discrepancies or disconnect between theory and practice, experiences pre-service teachers received during their university courses and practicum and the overall practicalities of learning how to teach. As mentioned earlier, since the inception of the education blueprint in Malaysia, teacher education are going through some changes to how new teachers are being prepared and to align with the needs of today’s teaching environment. In any changes, it is sometimes challenging for teacher educators to determine the efficiency and effectiveness of their academic programs. We feel that the 38 items can help in the decision and policy making processes and in determining the success of any changes made. However, caution is needed whenever items constructed in a western setting are to be administered to an Asian group of preservice teachers. Understanding the importance of this matter, we examined the validity of the 38-item program coherence in a Malaysian preservice teacher setting.

## **Methods**

### **The Translated Malaysian Teacher Education Program Coherence Questionnaire**

The 38-item program coherence questionnaire was translated into the Malay language with permission from the original authors. We deemed this necessary as the courses in the teacher education university in which this study took place were all in the Malay language. Thus, by translating it into the Malay language provided a common linguistic response. Two professional and certified English-Malay bilingual translators, who were not involved in the research, provided the translation. Both these professional translators also had no prior knowledge of the objectives or the specific context of the research. The first translator interpreted and translated the original 38-item, thenceforth, the second translator had it back translated into English for verification. When compared, the back translated version had similar perspective with the original version. In the translation process, two items (from opportunities to enact practice) were deleted as maintaining these two items had almost identical and interchangeable meanings to two other items when translated into the Malay language. In any translation process, the translators had to employ various strategies such as omission, deletion or classifier to maintain the integrity of the original versions (Jakopson, 2000). A pilot study of 20 preservice teachers were administered the final 36-item Malay language version. They were requested to complete the questionnaire and at the same time to write in columns provided, any issues they encountered while responding to the items. There were no misleading items and the preservice teachers were able to understand what the items asked of them.

## **Participants**

The preservice teachers for the current study came from two different cohort of a teacher education university in the state of Perak, Malaysia. These preservice teachers have

just completed their 16-week practicum in selected secondary schools and have returned to campus for their final eighth semester when this study took place. The sampling procedure was based on the natural grouping of the 'Reflection Course' classes the participants had to attend based on their academic majors. The data from the first cohort was collected between September to November 2014 ( $N=220$ ) and the second cohort was collected between February to April 2015 ( $N=234$ ). Altogether, a total of 454 preservice teachers (84 males and 370 females ranging in age from 22 to 29) participated in the study. It was important that they knew that participation was on a voluntary basis and confidentiality of all the information collected was assured. Two review boards provided the ethical consent to carry out the study.

### **Procedure**

The 36-item Malaysian teacher education program coherence questionnaire was administered at two different times. The first collection was carried out between September and November 2014, while the second collection was conducted between the months of February and April 2015. Both data was collected during preservice teachers' regular classes. Administration of the questionnaire was also assisted by a research assistant. In both circumstances, participants were aware of the purpose of the study. The first dimension of the 36-item program coherence questionnaire (opportunities to enact practice) had 17 items; and the second dimension (perceived an explicit coherence between their courses and the real teaching environment) had 19 items. The items from opportunities to enact practice were rated on a four-point options (1=none – 4=extensive opportunity) while the coherence items were rated on a four-point scale (1=strongly disagree – 4=strongly agree).

### **Data Analysis**

We conducted several statistical analyses to examine the construct validity and reliability of the Malay language 36-item teacher education program coherence questionnaire. This was deemed important as the original program coherence questionnaire was theorized, although yet to be proven, as a two dimensional structure (Hammerness & Klette, 2015) but the psychometric properties of 19 items from the second dimension showed a three factor structure (Canrinus, Bergem, Klette & Hammerness, 2015). Furthermore, the Malaysian translation of the program coherence questionnaire was the first of its kind to be trialed in the Malaysian teacher education context. The population from which the original questionnaire was meant for could possess different characteristics to that of the Malaysian preservice teachers, therefore, the standard application of its validation needed to be conducted.

First, the empirical structure of preservice teachers' responses to the questionnaire items within which the preservice teachers' perceptions of their own teacher education preparation are embedded was captured via a common factor model through an exploratory factor analysis (EFA). The factor analysis also allowed us to test that the items were also associated with the respective factors. Data from the first cohort ( $N=220$ ) was used for the EFA. We used principal component axis method to extract the factors as well as an orthogonal rotation (varimax rotation) to facilitate the interpretation of the dimensions. Next, the confidence with which the extracted factors could be respectively regarded and interpreted as representing the extracted constructs was tested using the alpha reliability coefficients.

We conducted a confirmatory factor analysis (CFA) to test the extracted factor structure with the second data set ( $N=234$ ). According to Browne and Cudeck, (1992) and

Cabrera-Nguyen (2010) – it is advisable to use different cohorts to test data fit after an EFA. A factor structure derived from an EFA will almost always fit very well in a CFA using the same data. Therefore, EFA should be followed by CFA using a different sample to evaluate the measures from an EFA's factor-structure and psychometric properties. To evaluate the fit of the measurement model, several fit indices - the goodness-of-fit index (GFI), the comparative fit index (CFI), the Tucker-Lewis fit index (TLI) were used. According to Hair, Black, Babin and Anderson (2010), levels of GFI, CFI and TLI equal to or above 0.90 are acceptable. A parsimony correction index using a root mean square error of approximation (RMSEA) with level below 0.08 suggests a moderate model fit while a RMSEA level equal to or below 0.05 indicates a good fit. We also reported the Chi-square statistic ( $\chi^2$ ), the composite reliability (CR) and the average variance extracted (AVE).

Finally, we felt it was necessary to establish whether the scales were valid according to an external criterion. To do this, we correlated the obtained factors with teaching efficacy using the second data set ( $N=234$ ). An integrated preservice teacher preparation has been suggested to be able to influence how efficacious preservice teachers are in the classroom (Gurvitch & Metzler, 2009; Hoy & Spero, 2005; Smith, Corkery, Buckley & Clavert, 2013). We expect that the factors will be positively correlated with positive teaching efficacy. The Malaysian version of the Teachers' Sense of Efficacy Scale (Goh, 2009) was administered at the same time with the Malaysian teacher education program coherence questionnaire. The Malaysian Teachers' Sense of Efficacy Scale specifies teaching efficacy in three areas: student engagement, teachers' efficacy in classroom management and discipline and overall instructional practices. Respondents indicate their perception of their efficacy regarding each teaching task/item on a 5-point Likert-type scale (1=not at all - 5=a great deal). In the present study the internal consistencies, ranged from  $\alpha = .74$  for efficacy in student engagement to  $\alpha = .85$  for efficacy in instructional practices. It is noteworthy to comment that the size of the two sets of the sample satisfied the minimum requirements for the current investigation as suggested by several authors (e.g. Gorsuch, 1983; Tabachnick & Fidell, 2001).

## Results

When skewness and kurtosis were calculated, both these measures indicated that the sample was within an acceptable range of +2 to -2 (Hair, et al, 2010) for the analysis. All items had values below 1.96. The results of the validation process are described below.

### Exploratory Factor Analysis

In order to evaluate the factorial structure behind the Malaysian preservice teachers' responses to the Malay language program coherence, an exploratory factor analysis (EFA) was conducted with the first set of the data ( $N=220$ ). The choice of an EFA was not based on any previous study, as to our knowledge, there has been no previous study conducted or published as yet on the psychometric properties of the original teacher education program coherence questionnaire although Canrinus, Bergem, Klette and Hammerness (2015) used an EFA to determine the factor structure of their 19 items. However, our choice of an EFA was based on: i) the intention to see if the 36 items were able to load onto the hypothesized two dimensions, ii) the need to identify the number of factors to retain and, iii) the need to determine the relationships between the factors. For this purpose, a principal component analysis with varimax rotation was carried as there was a likelihood that the factors were

correlated (Matsunaga, 2010). The number of factors to retain was decided with the eigenvalues greater or equal to 1.0 (Costello & Osborne, 2005). Only items which loaded at 0.40 and above were taken into account (Johnson & Wichern, 2014).

The results of the EFA did not show that the items loaded onto the hypothesized two dimensions but instead what emerged were four factors. A total of 51.39% of the item variance, which showed an eigenvalue value of greater than one, could be explained by these four underlying factors (see Table 1). The factor correlations suggested that the four factors were related (correlations ranging from 0.48 to 0.58;  $p < 0.01$ ).

A fairly clear factor which accounted for 13.86% of the total variance looked at the extent to which preservice teachers perceived that they had opportunities to enact actual teaching practices like setting clear routines, classroom organization, class discussion, manage transitions, analyze pupil learning and providing feedback to pupils' work. We named factor one - 'Opportunity to enact practice' (7 items). This factor had good internal consistency with a Cronbach's alpha of 0.79. The second factor, explained 13.03% of variance, was named 'Opportunity to analyze practice' (6 items). Similarly, the internal consistency was good with a Cronbach's alpha of 0.86. This factor measured the extent to which preservice teachers were able to analyze or critique classroom textbooks, curriculum, their lesson plans or materials from other teachers to create their own materials. The third factor was termed 'Opportunity to connect ideas across courses' (5 items) had 12.31% of its variance explained and also had a robust Cronbach's alpha of 0.83. It looked at whether preservice teachers perceived that their education courses provided opportunities for them to connect one idea to another from different courses, know the vision of good teaching advocated by the teacher education and to be able to project their own trajectory of learning. The fourth and final factor was called 'Coherence between courses and practical experience' (12 items) measured if the same theories, strategies and techniques preservice teachers learnt during their coursework were used during their practicum. This factor explained 12.14% of the total variance with a Cronbach's alpha of 0.85.

#### **Non-loading or Multi-loading Items**

It must also be noted that six items did not load into any of the four factors or loaded on more than one factor. One possible reason could be that preservice teachers may have felt confused whether some of the items ask about opportunities to enact practices during university classes or to reflect what they have done in their practicum during their compulsory 'Reflection Course', for example, item 2 ("Practice or rehearse something you planned to do in your classroom") and item 8 ("Watch or analyze videos of classroom teaching"). Another likely explanation could be that these tasks are not familiar experiences found in their courses. Item 9 ("Discuss experiences from your own pupils' learning in your university classes") did not load on any factor either. A likely explanation could be that this activity is not carried out in their university courses prior to their practicum experiences. In the preservice teachers' courses, from the university from which this study was carried out, they only begin to reflect and discuss their pupils' learning in the eighth semester after they have returned from the practicum. Practicum for these preservice teachers was a one-off affair in their seventh semester. This could be why these preservice teachers did not quite relate to this particular item. The final three items which did not load are item 15 ("Solve problems, read texts, or do actual work that your own pupils will do"), item 25 ("The faculty knew what was happening in my other courses, i.e. assignments, readings, key ideas"), and item 29 ("What I learned in my fieldwork conflicted with what I learned in my university courses"). Possibly these items captured variation in some aspects of the preservice teachers'

experiences during their courses and practicum which are better explained with the other items. Since these items corresponded to more than one factor, we omitted them in the CFA. More research will be needed to determine how these items might be best used as a psychometrically valid measure of program coherence. Despite the absence of these six items, it is noteworthy to comment that the degree of items without clear loadings is not extensive and, in our sample, the preservice teachers seem to demonstrate clearly the underlying constructs of four teacher education program coherence.

Item	Label	Factors			
		Cronbach Alpha			
		.79	.86	.83	.85
		1	2	3	4
1	Plan for teaching (develop unit plans, or lesson plans, develop instructional materials)	.79			
3	Examine samples of pupils' work	.76			
4	Examine samples of your own pupils' work	.62			
5	Examine actual teaching materials (sample curriculum, units, lessons, from real teachers)	.63			
6	Examine national/state/local/professional curriculum/standards/guidelines	.47			
7	Examine transcripts of real classroom talk or pupil discussions	.76			
10	Experience your teacher educator modelling/demonstrating effective teaching practices	.43			
11	Read, analyse or discuss 'broad' educational theory (foundational theory about teaching and learning, adolescent development, e.g. Vygotsky, Piaget, Bruner)		.82		
12	Read, analyse and discuss educational theory that is specific to your subject matter (i.e. research on teaching math/language arts/ history/social science/languages or other subjects)		.77		
13	Read, discuss or analyse theory in your subject matter theory (i.e. literary theory/mathematical ideas/historical analyses/theories within natural science or social science/languages etc.)		.68		
14	Use theory that you are reading in class, to analyse or examine your own experiences as a classroom preservice teacher		.59		
16	Read, analyse and discuss general research methods (how to conduct educational research, about qualitative or quantitative research, about survey or case study methods, etc.)		.57		
17	Read, analyse and discuss research methods you can use in investigating pupil's learning or other questions in your own classroom (how to do 'action research' or 'inquiry' in your classroom)		.46		
18	Learn about the vision of good teaching that your teacher education program promotes			.51	
19	Connect ideas from one class to another in the same course			.62	
20	Connect ideas from one course to those in another			.66	
21	Trace your own trajectory of learning—reflect upon the ways your own understanding of teaching and learning was developing			.72	
22	Make connections between educational theory and the actual classroom teaching you were engaged in			.71	
23	The program articulated a clear vision of teaching and learning				.42

	Factors			
	Cronbach Alpha			
	.79	.86	.83	.85
24 I heard similar views about teaching and learning across the courses in the program				.48
26 My courses within the teacher education program seemed to be intended to build an understanding over time				.48
27 When ideas or readings were repeated in my courses, they were elaborated / treated more deeply				.42
28 I saw connections among ideas, and concepts across courses in the program				.42
30 My student teaching experience allowed me to try out the theories, strategies and techniques I was learning in my classes at the teacher education program				.64
31 What I learned in my courses reflects what I observed in field experiences				.62
32 The faculty was knowledgeable about the program as a whole				.59
33 In my practicum I observed teachers using the same theories, strategies and techniques I was learning about in my courses at the teacher education program				.47
34 The faculty made explicit references to other courses				.50
35 The faculty was knowledgeable about what I was required to do in my practicum				.72
36 The faculty was knowledgeable about the quality and nature of my practicum				.69
Eigenvalue	10.29	2.19	1.94	1.42
Percentage explained	13.86	13.03	12.31	12.14
Cumulative percentage explained variance	13.86	26.93	39.24	51.39

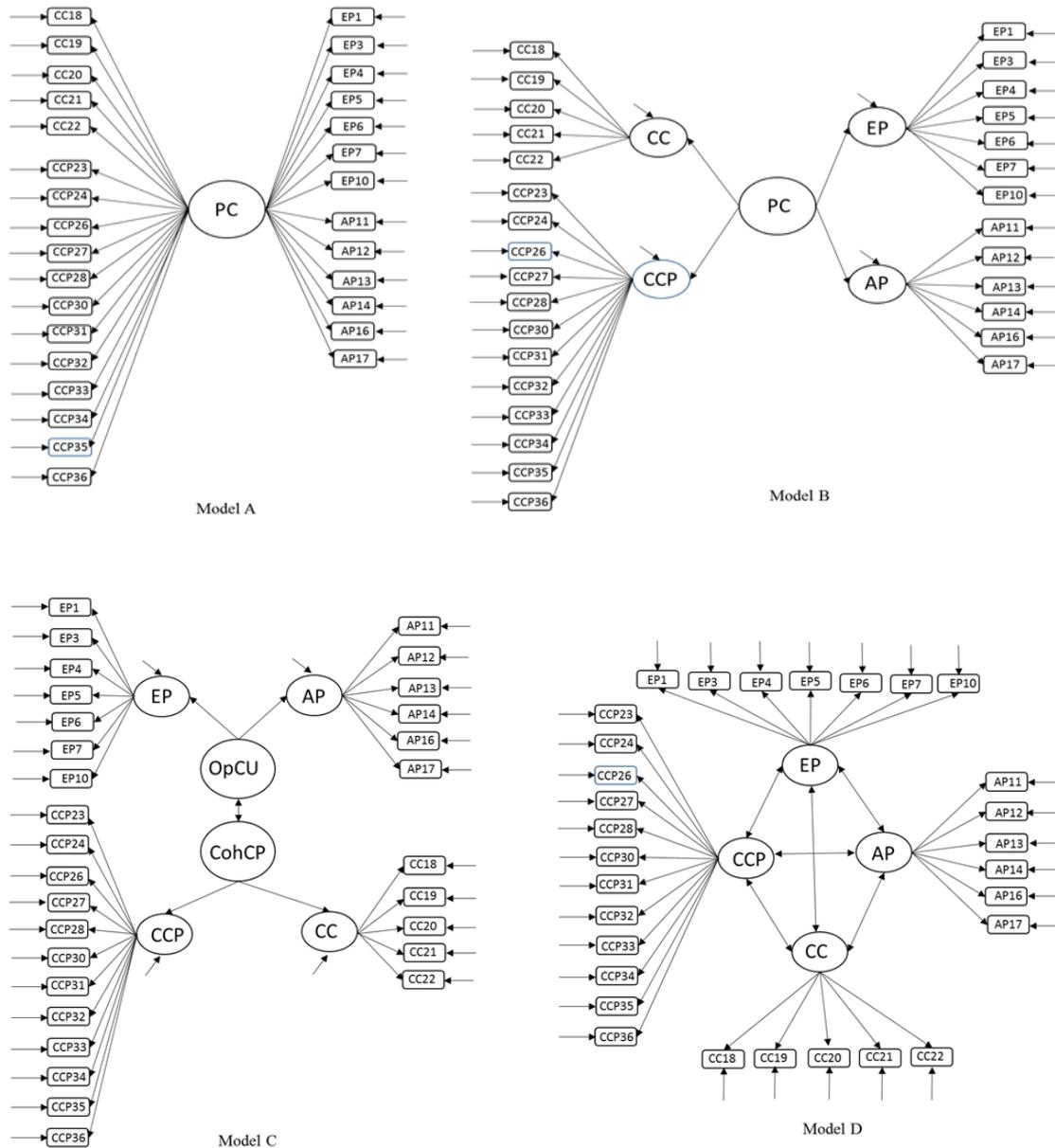
Note: The items were adapted from the CATE project. Permission was granted from the original author, see: [www.tinyurl.com/CATEuio](http://www.tinyurl.com/CATEuio). The Malay language version can be obtained from the first author.

**Table 1: Exploratory factor analyses factor loading of the Malaysian teacher education program coherence questionnaire**

### Confirmatory Factor Analysis

Using an independent sample ( $N=234$ ), we ran a confirmatory factor analysis (CFA) to test the four factors derived from the EFA. Several types of models were compared following suggestions provided by Rindskopf and Rose (1988) as shown in Figure 1. A single first order factor (Model A) in which all items loaded freely on the factor was first tested. There was a possibility that a single first order factor might be sufficient to explain the relationships between the items. Model B was a single second-order factor model. In this model, there were first-order factors representing ‘Opportunity to enact practice’, ‘Opportunity to analyze practice’, ‘Opportunity to connect ideas across courses’ and ‘Coherence between courses and practical experience’, and a second-order factor representing ‘Program coherence’ upon which the first order factors loaded. Thirdly, to test whether in fact two factors were needed, we fitted an alternative model with two second order factor (Model C). This dual second order model had four first order factors and two second order factors (opportunities to connect university courses and coherence between courses and practicum). The final alternative model tested a group factor model with four correlated

factors (Model D) corresponding to the relationship between ‘Opportunity to enact practice’, ‘Opportunity to analyze practice’, ‘Opportunity to connect ideas across courses’ and ‘Coherence between courses and practical experience’. Model D was tested to eliminate the possibility that models with additional structure (second order factor) were better fit or had the ideal structure indicated in the data (Wetzels, Odekerken-Schröder & van Oppen, 2009).



Note: Circles represent factors, squares represent observed variables. PC=Program coherence; EP=Opportunity to enact practice; AP=Opportunity to analyze practice; CC= Opportunity to connect ideas across courses; CCP=Coherence between courses and practical practice; OpCU=Opportunities to connect university courses; CohCP=Coherence between courses and practicum

**Figure 1: Confirmatory factor analysis models**

Table 2 showed that, except for Model D, models A, B and C did not fit the data well. Model A, B and C had fit indices that were below the recommended values (fit indices < 0.90 and RMSEA > 0.05). Model D revealed acceptable goodness-of-fit between the model and the data as evidenced by the values of 0.90 and greater for the GFI, CFI and TLI and values of RMSEA at 0.05.

Model	$\chi^2$	df	$\chi^2/df$	p	GFI	CFI	TLI	RMSEA
Model A	1999.72	405	4.94	$p < 0.001$	0.76	0.72	0.70	0.08
Model B	1110.72	400	2.78	$p < 0.001$	0.74	0.87	0.85	0.07
Model C	1121.11	401	2.80	$p < 0.001$	0.88	0.87	0.86	0.06
Model D	878.8	396	2.22	$p < 0.001$	0.90	0.92	0.91	0.05

Note: GFI=goodness-of-fit index; CFI=comparative fit index; TLI=Tucker-Lewis fit index  
 SRMR=standardized root mean square residual; RMSEA=root mean square error of approximation

**Table 2: Goodness-of-fit indices of the four models**

Table 3 presents the standardized factor loading, the squared multiple correlations ( $R^2$ ), Composite Reliability (CR) and Average Variance Extracted (AVE). All factor loadings were good and in the recommended value of above 0.50 (Hair, et al, 2010). The items load on the factors in a similar fashion to the exploratory results (see Table 1). However, the result of the chi-square for Model D was not satisfactory. Nevertheless, Bandalos and Finney (2010) suggested that if the chi-square failed to reveal appropriate level, it did not mean the model should be discarded but instead to look at the other goodness-of-fit and to determine good fit. Model D satisfied the criteria of a good fit. Hair et al. (2010) suggested that a CR should be calculated to reveal the internal consistency among all indices. The higher the value of the CR would indicate a greater internal consistency among those indices and also to indicate adequate convergence. Fornell and Larcker (1981) suggested that CR should be greater than 0.7. All the four constructs in Model D had CR values of between 0.77 and 0.85. Upon calculation of the AVE, all four constructs had a value below the guideline of 0.50 (Fornell & Larcker, 1981). However, Malhotra and Dash (2010) asserted that an adherence to the value of 0.50 is overly stringent, especially if the constructs showed strong CR values. Similarly, Kenny and Fahy (2011) emphasized that if the threshold of the CR exceeded 0.60, the constructs would have demonstrated sufficient validity.

### Criterion Validity

As predicted, the correlational findings between the four perceptions of program coherence and the three measures of teaching efficacy showed strong correlation and were statistically significant (Table 4). If preservice teachers perceived that their program had coherence, they were more confident to carry out their roles as teachers such as how they engage students in learning, planning lessons, using appropriate teaching strategies and classroom management. The patterns of correlation showed evidence for the criterion validity of the present study.

Model D item numbers	Factor Loading	$R^2$	AVE	CR
Opportunity to enact practice				
1	0.51	0.26		
3	0.59	0.35		
4	0.55	0.30		
5	0.57	0.33		
6	0.59	0.34		
7	0.65	0.42		
10	0.56	0.32	0.34	0.77
Opportunity to analyze practice				
11	0.65	0.42		
12	0.65	0.42		
13	0.63	0.39		

Model D item numbers	Factor Loading	R <sup>2</sup>	AVE	CR
14	0.62	0.39		
16	0.69	0.47		
17	0.62	0.39	0.42	0.81
Opportunity to connect ideas across courses				
18	0.65	0.42		
19	0.76	0.57		
20	0.68	0.46		
21	0.70	0.48		
22	0.69	0.47	0.48	0.82
Coherence between courses and practical experience				
23	0.62	0.39		
24	0.52	0.27		
26	0.63	0.39		
27	0.56	0.32		
28	0.60	0.36		
30	0.53	0.29		
31	0.53	0.28		
32	0.61	0.38		
33	0.50	0.25		
34	0.54	0.30		
35	0.57	0.32		
36	0.55	0.31	0.32	0.85

**Table 3: Standardized factor loading, squared multiple correlations (R<sup>2</sup>), Average Variance Extracted (AVE) and Composite Reliability (CR) for Model D**

Measures	Efficacy in Student Engagement	Efficacy in Instructional Practices	Efficacy in Classroom Management
Opportunity to enact practice	0.24 *	0.34**	0.28**
Opportunity to analyze practice	0.21 *	0.25**	0.23 *
Opportunity to connect ideas across courses	0.40**	0.51**	0.43**
Coherence between courses and practical experience	0.30**	0.36**	0.32**

\*  $p < 0.05$ ; \*\*  $p < 0.01$

**Table 4: Correlations between the perceptions of program coherence and teaching efficacy**

## Discussion

In the study, it was our purpose to validate a Malay language version of a program coherence questionnaire developed in Norway to be used in a Malaysian teacher education context. Our use of both an exploratory and confirmatory factor analyses from two different data sets, together with a criterion measure, have added to our confidence in our validity results. Taken as a whole, the findings of this study is the first of its kind to shed new light on the underlying structure of the questionnaire and provides a new perspective on the dimensionality of the Malaysian teacher education program coherence questionnaire.

The measures of validity and reliability presented here are supportive of the Malaysian teacher education program coherence questionnaire. The first main result of our investigation suggests that the items are appropriately grouped into four distinct dimensions, which we have termed ‘Opportunity to enact practice’, ‘Opportunity to analyze practice’, ‘Opportunity to connect ideas across courses’ and ‘Coherence between courses and practical

experience' as shown in the pattern matrix through an exploratory factor analysis. In addition, internal consistency for these factors was high (Cronbach's  $\alpha$  ranged from 0.79 to 0.85) (see Table 1). The second main result of this study is the confirmation that the four-correlated-factor model (Model D) (see Table 2 and 3) best describes the latent structure of the Malaysian questionnaire when compared with a series of alternative models. Results of the criterion validity showed that the four program coherence measures were positively associated with teaching efficacy (Table 4). Although the AVE did not achieve the value of  $>0.50$  (Fornell & Larcker, 1981), it must be noted that the findings of this investigation is a first undertaking on the program coherence questionnaire by providing a new perspective on the underlying structure of the Malaysian teacher education. According to Ping (2009), if it is a relatively new measure and is not well-established (which is true of the current questionnaire), then a new measure cannot always obtain a "perfect" AVE value. That said, further research on the validity of preservice teachers reporting on this questionnaire would help support a strong instrument.

The results of these findings have some noteworthy theoretical and practical implications. From a theoretical point of view, first, the Malaysian teacher education program coherence questionnaire is better conceptualized as four dimensions rather than a two dimensional structure. The first two dimensions 'Opportunity to enact practice' and 'Opportunity to analyze practice' are two separate components. The loading makes sense in pedagogical terms, preservice teachers first examines and analyses teaching plans, national curriculum/standards, examines actual pupils' work and actual teaching materials which is then followed by connecting these practices with educational theory. They learn about general research methods for use in investigating pupils' learning or other issues found in the classroom. Second, the area in which is originally described as 'perceived an explicit relationship between their courses and the real teaching environment' resulted in two factors - 'Opportunities to connect ideas between courses' (Factor 3) and 'Coherence between courses and practical experience' (Factor 4). Instead of loading onto one factor, there are instead two unique factors. The separate loading makes practical sense as preservice teachers are interpreting items in factor 3 with what they do during their courses at the university. Factor 4 is more related to how they used what they have learned (theories, techniques and strategies) in real circumstances and to what degree their teaching experiences are consistent with what they have learned. The third theoretical point of view is that the exploratory and confirmatory factor analyses provide reasonable evidence that these four constructs make up unique key features to explain whether a teacher education program is coherent in that it links theory with practice and offers opportunities to enact work of real teaching.

From a practical perspective, teacher educators might be asking about how this questionnaire could be used. Several implications are suggested here. Preservice teachers are the people experiencing the teacher education program. They know the programs they are asked about very well as they are the one immersed in it. Therefore, their ideas and perceptions through the responses from the questionnaire can prove to be invaluable inputs about the context in which they study. Examining coherence from the point of view of preservice teachers, instead of the faculty or administrators, enables researchers to learn firsthand about the learning experiences of new teachers. After all, teacher educators must continually invest their effort towards a teacher program that have well-aligned courses including the practicum to optimize the learning process and learning outcomes of their preservice teachers (Grossman, Hammerness, McDonald & Rondelt, 2008; Zundans-Fraser & Bain, 2016). Results from various studies (example, Geoghegan, Geoghegan, O'Neill, and White, 2004; Gurvitch & Metzler, 2009; Hoy & Spero, 2005; Smith, Corkery, Buckley & Clavert, 2013) have revealed, for example, a link between the accessibility, meaningfulness, and relevance of the instruction at the teacher education program, as perceived by the

preservice teachers, and the preservice teachers' positive teaching efficacy. In addition, the Malaysian teacher education program coherence questionnaire could be used as a diagnosing tool to investigate the impact of teacher preparation and of changes in preservice teachers' learning environment (e.g. curriculum changes, aligned courses, additional courses, etc.) on the teacher education program. This can be useful for policy-makers who want to acquire information efficiently, yet quickly, for decision making. Last but not least, Darling Hammond (2006) has advised that it is important there are clear communications and shared understandings between university supervisors, mentor teachers and preservice teachers during the practicum. Therefore, we suggest that university supervisors and mentors in schools stay connected and maintain an open dialogue through the use of the questionnaire at different intervals during the practicum as a means to gauge preservice teachers' ability to enact desirable teaching practices in schools. In summary, the questionnaire is valid enough, at least for this group of preservice teachers and for the university in which this study was conducted, to provide documentation and a 'common language' to evaluate development, refinement and assessment of the teacher education program.

## Conclusion

Overall, the present study suggests that the Malaysian program coherence questionnaire is a valid tool to examine preservice teachers' perceptions of experiencing coherence in their teacher preparation program. Nevertheless, some items did not load or had multi-loading and there are some limitations that must be mentioned here.

First, only preservice teachers from one university are sampled. The extent to which this sample differs from other preservice teachers could have limited the generalizability of the results. Therefore, samples of preservice teachers from other teacher education institutions may be helpful to further confirm the validity and reliability of the questionnaire or to optimize it to its widespread use. Second, the questionnaire requested preservice teachers to provide a perception of course and program coherence, and is not a direct measure of the existence of program coherence within the teacher education program. Therefore their ratings could be influenced by the degree to which preservice teachers interpret the items and constructs (Desimone, Porter, Garet, Yoon & Birman, 2002). Probably some form of interviews with the preservice teachers or class observations could act as a triangulation to support the survey results. It is to be noted that there are more females in the samples than males. This can be an issue of a sampling bias. However, Martin (2007) observes that gender differences usually have little impact on factor structures. Finally, although we explored the differential relationships of the four factors with teaching efficacy as part of the construct validation, future studies could associate different theoretical constructs such as teaching approaches (Goh, Wong & Hamzah, 2014; Trigwell & Prosser, 2004) or teacher's self-esteem (Dobbins, 1996) and that would further help support a robust instrument.

Despite these limitations, but with the knowledge that additional studies should be conducted to further validate the Malay language program coherence questionnaire, the present study offers a contribution towards addressing the challenges that have plagued the work of preparing teachers who are ready for the classrooms. We feel that such a tool is much needed for teacher educators and researchers alike who are interested in aligning teacher education curriculum, teaching, and the practicum, ultimately leading to initiatives motivated towards improving preservice and new teachers' learning experiences and outcomes.

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