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Abstract: *Raising the quality of initial teacher education can make an important contribution to raising the overall quality of the school system. In Australia, the National Framework for Professional Standards for Teaching is used as a common framework to set standards for the accreditation of teacher education programs. However, institution-wise assessments need to be carried out regularly to explore the quality of preparation pre-service teachers receive and to what extent they feel well prepared to enter teaching. This will enable teacher education programs to implement strategies to strengthen the link between university coursework and professional practice of pre service teachers. This paper discusses the development and validation of a scale to measure pre- service teachers' perceptions of preparedness to teach, readiness to engage with the teaching profession and self-efficacy in teaching. The study also proposes a model describing the relationship among these variables. Data was collected from 235 final year pre-service teachers using a newly developed questionnaire at an Australian university. Data shows that the Pre service Teacher Professional Experience (PTPE) scale is a theoretically sound, gender invariant and psychometrically valid instrument. The implications of using the scale in teacher education programmes are discussed in the context of the findings.*

Introduction

Designing and implementing effective programmes to prepare future teachers who are competent and confident to teach is the primary business of initial teacher education (Ingvarson et al., 2014). In Australia, to prepare *classroom ready* teachers who will make a positive impact on school student learning, every teacher education programme must meet clear and rigorous standards as outlined by Teacher Education Ministerial Advisory Group (TEMAG)'s (2014) report, *Action Now: Classroom Ready Teachers*. These standards are broadly conceptualised as to what pre-service teachers (PSTs) should know and be able to do when they enter the teaching profession (Ingvarson et al., 2014). Initial teacher education

providers are required to ensure that their graduates are able to meet these national professional standards for teachers which outline key elements of quality teaching. Known as Australian Professional Standards for Teachers, they are a public statement illustrating what constitutes teacher quality. They are comprised of seven standards (referred to as 'Standards' in this paper) which outline what teachers are expected to know and be able to do at four career stages: Graduate, Proficient, Highly Accomplished and Lead (Australian Institute for Teaching and School Leadership[AITSL], 2014). The seven Standards identify what is expected of teachers within three domains of teaching within their specific teaching context (See Table 1).

Domains of teaching	**Standards**
Professional Knowledge	1.Know students and how they learn 2.Know the content and how to teach it
Professional Practice	3.Plan for and implement effective teaching and learning 4.Create and maintain supportive and safe learning environments 5.Assess, provide feedback and report on student learning
Professional Engagement	6.Engage in professional learning 7.Engage professionally with colleagues, parents/ carers and the community

Table 1: Standards for Teachers at Four Career Stages (AITSL, 2014, p. 5).

The descriptors for the four career stages represent increasing levels of knowledge, practice and professional engagement for teachers. It is noteworthy that there is considerable overlap among the descriptors of these Standards, since teaching draws on aspects of all three domains (AITSL, 2014). The Graduate Standards underpin the accreditation of initial teacher education programmes. Therefore, at the successful completion of their initial teacher education programme, PSTs are expected to have met the Standards at the Graduate level. Progression through the four career stages takes place throughout their career via professional learning and using opportunities to engage with their school communities within and beyond the classroom (AITSL, 2014)

However, although the desired competencies for graduate teachers are outlined by Standards, it has been argued that "initial teacher education providers are not rigorously assessing the classroom readiness of their pre-service teachers against the Professional Standards" (TEMAG, 2014, p. ix) or whether such graduates perceive themselves as confident to teach in a classroom (AITSL, 2010). Therefore, there are calls for genuine assessment of *classroom readiness* of beginning teachers rather than an inference from the award of an academic qualification.

A *classroom ready* graduate is broadly conceptualised as a qualified graduate "who has the skills and knowledge for professional practice required by the Graduate level of the Professional Standards" (TEMAG, 2014, p. 87). Such graduates are, theoretically, competent and adequately prepared, ready to engage with the profession and therefore confident to teach in formal classroom settings. It has been noted that in order to achieve this goal, "robust evidence will be required of [initial teacher education] providers to show that their graduates have the knowledge and teaching practices needed to be classroom ready, against a national assessment framework" (TEMAG, 2014, p. xi). The characteristics of effective teacher education programmes are identified as those that demonstrate "evidence-based pedagogical approaches, effective integration of professional experience, rigorous and iterative assessment of pre-service teachers throughout their education, and assessments that ensure pre-service teachers are *classroom ready*" (TEMAG, 2014, xii). In Australia, as elsewhere, professional

experience in real classroom settings during the teacher education programme gives the PSTs the first opportunity to put theory into practice.

Teachers' perceived preparedness has been theoretically linked to the development of their teaching self-efficacy (Gigallo & Little, 2003; Housego, 1990; Jamieson-Proctor, Burnett, Finger, & Watson, 2006). Teachers who have a greater sense of perceived preparedness are likely to have a greater sense of self-efficacy (Darling-Hammond, et.al.,2002), since self-efficacy is conceptualised as a "cognition that mediates knowledge and action" (Raudenbush, Rowan, & Cheong, 1992, p. 150). Furthermore, their sense of self-efficacy forms within the early years of teaching and, once developed it is resistant to change (Tschannen-Moran et al.,1998). Hence, it is important to develop teachers' efficacy and its antecedents early on, that is from their first exposure to the teaching profession itself.

Examining the classroom readiness of PSTs before, during or after their professional experience may provide answers to the pertinent question for teacher education practitioners; *To what extent does the teacher education course advance pre-service teachers' sense of preparedness, develop their readiness to engage with the profession and enhance their self-efficacy in teaching?* Understanding the strength of such associations may enable teacher educators to identify gaps and develop interventions that strengthen the theory-practice link in teacher education programmes.

A Framework for the Assessment of Psts' Sense of Preparedness and Readiness to Engage with the Profession – Need for a New Instrument

As previously articulated, Australian PSTs, at the successful completion of their initial teacher education, are expected to have met the Graduate Standards (Table1). Therefore, if the aim of teacher educators is to ensure their graduates meet the requirements of the diverse classroom settings they will be entering, then their preparedness and readiness to enter teaching must be examined against the Standards. Consequently, there is a requirement for an instrument that can measure such critical elements in relation to pre-service teachers' professional experience in schools, which is a significant component of teacher preparation programmes. The Pre-service Teacher Professional Experience (PTPE) survey is a self-reporting parsimonious instrument that was developed specifically for this purpose.

A broad search of Australian teacher education literature identified a multitude of measures developed for gauging PSTs' preparedness to begin teaching and related variables such as self-efficacy in teaching. For example, the Survey of Final Year Education Students (Mayer et al., 2015) examined how well equipped graduates are to meet the requirements of the diverse school settings that they would soon enter. The Victorian Institute of Teaching (VIT) Future Teachers Project's survey instrument (Ingvarson, Beavis, & Kleinhenz, 2004) examines beginning teachers' feedback on their teacher education programs. Likewise, Louden and colleagues investigated perceptions of teacher education students' preparation for teaching in the two major areas, early years' literacy and middle years' mathematics teaching (Louden, Heldsinger, House, Humphry, & Fitzgerald, 2010). Student teachers' perceptions and associations between self-efficacy in behaviour management, preparedness and classroom experiences were investigated in Giallo and Little's study (2003). MA and Cavanagh (2018) explored the level of teacher self-efficacy of secondary PSTs before their professional experience. Perceptions of Tasmanian pre-service and beginning health and physical education (HPE) teachers in relation to their preparedness for teaching was examined in Swabey, Castleton and Penney's (2010) study. A similar study that examines PSTs preparedness to integrate technology in classroom teaching was conducted by Sweeney and Drummond (2013). Dawson and Shand (2019) used Tschannen-Moran and Hoy's (2001)

Teacher Efficacy Scale to compare teaching self-efficacy of PSTs in disadvantaged schools with PSTs placed in more advantaged school. However, a closer examination of these instruments indicated that they were purpose-driven, designed to suit the specific object of the study for which they were created, and hence they were found unsuitable or inadequate to fulfil the aim of the current study.

An extensive search of relevant literature revealed that although there are many instruments available including the scales mentioned here, there is a need for an instrument to measure the variables investigated in this study, which focussed on various teacher education programmes such as early childhood, primary and secondary programmes, with consideration given to the three domains of teaching and the desired practices prescribed by the graduate Standards. Hudson, Hudson, Weatherby-Fell and Shipway's (2016) investigation, where final year primary PSTs' self-reported confidence against each of the Standards was examined, shares some characteristics with the current study. However, the current study differs from Hudson el al's research. The current study acknowledges the theoretical relationship between feelings of preparedness and an increased sense of teaching efficacy (Darling-Hammond, Chung & Frelow, 2002) and investigates the extent to which such perceptions measured against Standards are influencing PST's perceptions of *readiness to engage* with the teaching profession and eventually their *self-efficacy* in classroom teaching. Thus, rather than providing a simple measure of teacher preparedness, the data collected with the newly developed PTPE can be used to analyse the predictive power of *preparedness* on their *readiness* and sense of teaching *self-efficacy.*

The purpose of this paper is to report on the construction and validation of PTPE which was designed to determine and measure relationships among three variables; namely, *teacher preparedness*, *readiness to engage* with the profession and *self-efficacy* in classroom teaching, close to point of graduation. Elements of PTPE drew largely from the Standards. *Teacher Preparedness* was conceptualised on major constructs emanating from four Standards for the two domains that are relevant for the graduate career stage. These Standards and the names of the constructs that subsumes them as on PTPE are given in Table 2.

Domains of teaching	**Standards**	**Construct Name on PTPE**
Professional Knowledge	1.Know students and how they learn	*Relation*
	2.Know the content and how to teach it	*Knowledge*
Professional Practice	3.Plan for and implement effective teaching and learning	*Strategies*
	4.Create and maintain supportive and safe learning environments	*Environment*

Table 2: Dimensions of Teacher Preparedness

The readiness to engage with the profession *(engage)* variable was conceptualised as the combination of ability and willingness (Baker, 2005) of PSTs to continue professional learning while on their professional experience in schools. Item generation of the *engage* variable was guided by Standard 6 (see Table 1). Standard 7, namely; engage *professionally with colleagues, parents/ carers and the community* was not considered in this procedure as the descriptors were not deemed to be relevant to PSTs' classroom experiences during their professional experience placement. Depending on the school site, most PSTs' professional learning takes place through the interaction with their supervising teacher and typically they

receive limited opportunity to engage with parents/carers and community during their professional experience. Likewise, Standard 5, which stipulates; "Assess, provide feedback and report on student learning" was excluded from the framework. On careful examination of relevant literature and from anecdotal evidence, this was identified as a Focus area where PSTs receive fewest opportunities during their professional placement (Hudson et al., 2016). PSTs report that they are excluded from such on-site experiences due to matters arising from "confidentiality" of parent/carer – teacher interviews (p.145). Furthermore, this is a real-world context that initial teacher education providers cannot include in their programmes (Hudson et al., 2016 p. 145). Therefore, this Standard was not included in the Framework.

Variable Descriptions

Based on a comprehensive review of the literature, we suggest a research model where pre-service teacher *preparedness* may influence their *readiness to engage with the profession (engage*) which in turn enhances their teaching self-efficacy in classroom teaching (*efficacy*). It should be noted that, as Giallo and Little (2003) affirm, a PST's perceived preparedness does not necessarily denote that they are prepared in reality, but such perceptions are essential in bolstering their sense of self-efficacy and readiness. A brief discussion of these constructs selected for inclusion in the model is given below.

Teacher Preparedness

Relation

Knowing students and knowing how they learn are critical aspects of teaching regardless of the level of schooling. Standard 1 prescribes a PST should demonstrate "the knowledge and understanding of the implications for learning of students' physical, cultural, social, linguistic and intellectual characteristics" (AITSL, 2014. p. 10). They should also "understand principles of inclusion and strategies for differentiating teaching to meet the specific learning needs of students including those with disabilities and Aboriginal and Torres Strait Islander *students" (*p.7). Teachers with a sound knowledge of how students learn tend to be more engaged with their profession (Darling-Hammond et.al., 2002).

Knowledge

A vast body of literature emphasises the association between teachers' pedagogical content knowledge and their sense of efficacy and readiness to teach (Darling-Hammond & Bransford, 2005; See also Kola & Sunday, 2015 for a review). Pedagogical content knowledge is defined by Shulman (1987) as one of seven categories of teachers' knowledge defining it as "that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding" (p. 8). Highly effective teachers are found to possess strong pedagogical content knowledge and this is a differentiating factor between expert teachers and PSTs (Borko & Putnam, 1996). Standard 2 prescribes the expected levels of PSTs knowledge of the content of their subjects and curriculum they are teaching.

Strategies

Effective teaching is critically reliant on the skill of implementing effective teaching strategies and a burgeoning body of literature exists (see Hattie & Donoghue, 2016) on its association with teachers' readiness and sense of efficacy in teaching. Standard 3 prescribes at graduate level, that a teacher should be able to set learning goals for "students of varying abilities and characteristics, plan lesson sequence", select and choose a variety of resources and teaching strategies and use effective classroom communication (AITSL, 2014. P.14).

Environment

Standard 4 prescribes the skill of creating and maintaining supportive and safe learning environments and implementing fair and equitable behaviour management plans as one of the fundamental elements of high-quality, effective teaching (AITSL, 2014). A substantial body of literature offers support to the claim that a sound knowledge of creating a safe and positive classroom environment influences classroom readiness of the teacher (see Egeberg, McConney, & Price, 2016 for a comprehensive review). This gives compelling evidence for the construct to be considered as a precursor of PSTs' teaching self-efficacy.

Engage

The *engag*e variable examines the ability and willingness of PSTs to engage in professional learning from the teaching community, which can be a source of efficacy and confidence in the process of adopting new teaching practices (Darling-Hammond, Hyler, & Gardner, 2017). PSTs' first exposure to the teaching profession is their professional experience, during which they develop knowledge of "working ethically, collaborating with colleagues, external professional and community representatives, and contributing to the life of the school" (AITSL, 2014, p.1). This learning can be assumed to contribute to the development of their efficacy in teaching, though a causal relationship is yet to be established.

Self-efficacy

Consistent with Bandura's conceptualisation of self-efficacy on social cognitive theoretical framework (Bandura, 1977), Tschannen-Moran and Hoy (2001) provided an operational definition for teacher efficacy as "a teacher's judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (p.783). Antecedents of teaching self-efficacy has been found to vary among novice and experienced teachers (Tschannen-Moran & Hoy, 2007), since it is "a motivational construct based on self-perception of competence rather than actual level of competence" (p. 944). In measuring self-efficacy, items were adapted from Darling-Hammond et al.'s (2002) scale that examined PSTs' confidence in their ability to accomplish certain teaching goals such as promoting positive behaviours in the classroom. *Engage* was considered as instrumental in the development and maintenance of PSTs' teaching self-efficacy.

Based on the review of the literature, it was hypothesized that a PST with a greater sense of preparedness will display a higher degree of readiness to engage with the profession

and display a greater sense of teaching self-efficacy. The theorised relationships among the constructs are pictorially represented in Figure.1.

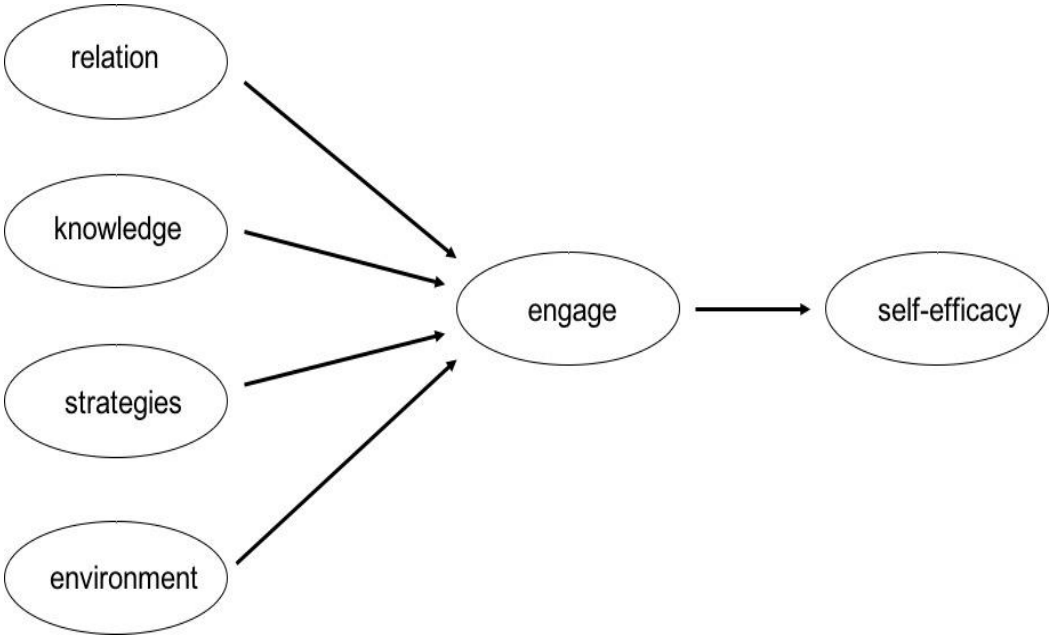

Figure 1: The hypothesised relationships among the constructs of the proposed research model
Variables Summary

PTPE was developed to measure the six constructs (four predictor *teacher preparedness* variables and the two outcome variables, *engage* and *efficacy*) of the proposed research model. The strength of associations among the constructs can be examined using sophisticated strategies such as Structural Equation Modelling (SEM) (Kline, 2011). The theoretical development of the subscales of the PTPE was discussed in earlier sections. The following sections describe the participants and validation of the following psychometric properties of the PTPE: (a) congenerity of the PTPE subscales; (b) reliability of the PTPE subscales (Cronbach's alpha estimates for corresponding factors); (c) factorial structure of the PTPE; (d) construct validity (content, convergent and discriminant validity) of the PTPE and; (e) factorial invariance across critical groups (male vs female).

Participants

Participants of the study were PSTs at University X in metropolitan Sydney from three different teacher education programmes, namely Early Childhood, Primary and Secondary and were in the final stages of the programme undertaking professional experience in schools. At this university, PSTs undertaking the primary and secondary teaching degrees undertake three practicum experiences throughout their courses. Two are in schools where they participate in classroom teaching under the supervision of a qualified teacher, and the third is a community practicum, which often involves working to support young people in focused ways. The community practicum may be in the form, for example, of working with small groups of students to support their reading, or working with students from a refugee background in dedicated homework centres. The early childhood course can qualify PSTs to teach from birth to 5 (where they exit after 2 years) or birth to 12 where they undertake another semester on top to qualify. This degree requires them to undertake three placements,

one in a birth-2 setting, one in a year 3-5 setting and 2 placements in the same school teaching children across two different stages.

The participants of this study completed surveys about their sense of preparedness to teach and teaching efficacy pre (time point 1) and post (time point 2) final in-school professional experience in 2017. There were no exclusion criteria for the sample selection, and students participated voluntarily each time. Sample sizes were 235 (females = 167, males= 68) in time point 1 and 195 (females = 140, males = 55) in time point 2 respectively after data screening. Data collected at time point 1 was used for scale validation.

Development of the Instrument

The newly developed PTPE originally consisted of 58 items constructed on the basis of the six constructs namely, *relation, knowledge, strategies, environment, engage and self-efficacy*. Content validity, which indicates the extent to which items are representative of the domains they are supposed to measure (Kline, 2011), was ensured with subject matter expert reviews. The research team included experienced teacher educators in respective educational settings and rigorous review processes were conducted during item development to ensure face validity.

Item development was guided by Standards and an existing well-established scale
(see Table 3 to find the items and the scale they were adapted from). In line with calls for teacher education programmes to address more intently the development of teaching practices as opposed to espoused knowledge, all indicator items for preparedness focus on pre-service teachers' perceptions of implementing specific practices associated with relationships, knowledge enactment, teaching strategies and developing the classroom environment (Darling-Hammond, 2014). Each of the subscales was inferred from seven to eleven indicator items. The phrasing of the items was differentiated to suit the educational settings identified in the earlier section of the paper.

Some overlap may be observed between the items on PTPE and AITSL self-assessment tool (AITSL Self-Assessment tool, n.d) as they both use prescribed Standards and their descriptions for item generation. However, these two tools differ in many ways. The AITSL tool includes 148 items and completion may take an hour of time, suggesting high chance of survey fatigue, which is problematic for research purposes. Moreover, the AITSL tool is clearly aligned to in-service teachers whereas the PTPE's items are aligned for PSTs' experience during their professional experience. While the AITSL tool can provide a report to teachers about their level of proficiency for each teacher standard, PTPE can be used to draw out relationships among PSTs' preparedness, their readiness to engage in the profession, and their self-efficacy.

On each item of all subscales except for *self-efficacy*, students rated themselves on a 5-point scale (1 = Not at all to 5 = Extremely well). The options for *self-efficacy* were on a scale where 1= Strongly Disagree and 5= Strongly Agree. Although Likert scales employ various number of scale points such as 4-, 5-, 6-, or 11-point, the comparative sensitivity of these scales is debatable. Leung's (2011) study findings indicate that having more scale points can reduce skewness and kurtosis of data and the distribution will be closest to the normal. However, there was no major difference in the internal structure in terms of means, standard deviations, item–item correlations, item–total correlations, Cronbach's alpha, factor loadings and factor structure of these scales. While an instrument with longer scale points has some advantages, it has been argued that it entails more effort, and hence fatigue from respondents.

Furthermore, although 5- and 11-point scales possess a neutral point, no difference was noted in comparison with scales that have no neutral point (such as 4 – or 6- point scales). Therefore, this study employed a 5- point scale which is more convenient and less tedious for the respondents.

One of the major concerns of self-reports in the form of pencil-and-paper questionnaires is possibility of response bias (Paulhus, 1991). A major source of response bias is socially desirable responding (SDR), which can interfere with the validity of the data collected. It is argued that respondents may display a natural inclination to look good; therefore, their actions can range from a conscious attempt of impression management to a nonconscious form of self-deception. Impression management can include actions such as exaggeration, faking, or lying on their responses, so that the participant looks good; whereas self-deception includes actions such as self-favouring bias or self enhancement, defensiveness, and even denial (Paulhus & Vazire, 2007). At the same time, some measurement experts argue that the concern over the influence of SDR on the validity of data is often exaggerated (Paulhus, 2017). For example, the validity of a number of research instruments are found to change little when SDR was controlled (Paulhus, 2017). Paulhus (2017) further cautions that any possible impact of SDR should be minimised before it can occur by appropriate item design and survey administration, rather than after data has been collected. To control the SDR effects, this study employed approaches of Demand Reduction (Paulhus & Vazire, 2007) method which included maximising anonymity and confidentiality of data collection during the survey administration. As participants were made aware that no personally identifying information was collected in the survey, the demand for SDR was kept low.

To what extent did you feel prepared to:

Numerical identifier on PTPE	**Item**	**Construct name**
2.1.1	Use knowledge of students'/children's social, emotional, physical and cognitive development to inform planning and teaching.	***relation***
2.1.2	Build rapport with students/children.*	
2.1.3	Use knowledge about the diversity of all students'/children's backgrounds, including Aboriginal and Torres Strait Islander students/children, to inform planning and teaching. *	
2.1.4	Use knowledge of learners' diverse strengths and needs including those with English as an Additional Language/Dialect, Gifted and Talented, and Learning Support students to inform planning and teaching*.	
2.1.5	Employ strategies to motivate and engage all students/children in learning. *	
2.1.6	Help learners to become self-motivated and self-directed. **	
2.1.7	Use knowledge of students'/children's family and cultural backgrounds and how they influence learning to inform planning and teaching. **	
2.2.1	Draw upon your own content knowledge to organise curriculum in ways that support meaningful learning. *	***knowledge***
2.2.2	Create integrated curriculum or cross-curriculum perspectives**	

2.2.3	Teach concepts, knowledge, and skills in ways that enable students to learn**	
2.2.4	Develop curriculum that builds on students'/ children's experiences, interests and abilities.**	
2.2.5	Evaluate curriculum materials / resources for their usefulness and appropriateness. **	
2.2.6	Incorporate literacy strategies into all areas of teaching. *	
2.2.7	Incorporate ICTs/ technology in ways that lead to meaningful learning*.	
2.2.8	Incorporate numeracy strategies into all areas of teaching. *	
2.2.9	Plan sequential lessons/ learning experiences*.	
2.3.1	Set learning goals for students that are developmentally appropriate. *	***strategies***
2.3.2	Verbally present content to small and large groups in ways that are clear and that engage learners. *	
2.3.3	Use teaching strategies that promote active student learning.**	
2.3.4	Use strategies that foster positive relationships, collaboration and co-operative learning. *	
2.3.5	Give productive feedback to students/children to guide their learning. * *	
2.3.6	Assess student's/ children's learning and use this to inform planning. *	
2.3.7	Implement and facilitate student/ child -centred learning. *	
2.3.8	Develop students'/ children's inquiry, investigation, questioning and discussion skills*.	
2.3.9	Respond to students' / children's interests, ideas and questions. *	
2.4.1	Use effective verbal and nonverbal communication strategies to guide students' /children's learning and behaviour. **	***environment***
2.4.2	Develop a classroom environment that promotes social development and group responsibility. **	
2.4.3	Maintain a well organised, purposeful learning environment.**	
2.4.4	Provide clear directions and explanations that support students'/children's learning. *	
2.4.5	Manage challenging behaviours. *	
2.4.6	Speak appropriately to a student/child individually about challenging behaviours*.	
2.4.7	Support students / children to resolve interpersonal conflicts*	

2.5.1	Co-teach with your mentor teacher. *	***engage***
2.5.2	Use feedback from your mentor teacher, university advisor and peers to improve practice. *	
2.5.3	Attend and participate in staff meetings*.	
2.5.4	Work with your mentor teacher to communicate with families about students' / children's learning*.	
2.5.5	Provide a clear rationale for your teaching decisions*.	
2.5.6	Problem solve with colleagues.**	
2.5.7	Work with your mentor teacher to work with families to better understand students/ children and to support their learning.**	
2.5.8	Reflect on your own learning and establish and monitor professional learning goals*.	

Note. * = original items; ** = adapted from Darling-Hammond, Chung & Frelow (2002)

Please provide an X in the box that best reflect your feelings about teaching at this point in time in relation to the following statements.

Numerical identifier on PTPE	Item	Construct name
3.3.1	I am confident in my ability to promote positive behaviours in the classroom**	***self - efficacy***
3.3.2	My students/ peers have more influence on their motivation and performance than I do.	
3.3.3	I am confident in my ability to teach all students/ children to high levels.**	
3.3.4	I am confident I am making a difference in the lives of children/my students**.	
3.3.5	I am uncertain how to teach some of my students/ children**.	
3.3.6	I am confident of my ability to integrate information technology into my students' / children's learning. *	
3.3.7	I am confident that I can use a variety of assessment strategies to determine student strength and needs and to inform my programme*.	

Table 3: Subscales and Items of Original PTPE

Note. * = original items; ** = adapted from Darling-Hammond, Chung & Frelow (2002)

PTPE also collected demographic data of students, their study pathways and included an opportunity for open-ended responses.

Data Analysis Procedures

Data Screening

Data screening, preliminary analyses and Cronbach's alpha reliability estimates were achieved using SPSS 24.0. Tests for congenerity, convergent and discriminant validity and, Confirmatory Factor Analysis (CFA) were conducted with AMOS (version 24) using Maximum Likelihood Estimation (Byrne, 1998).

Dealing with Missing Data

Missing values for single items were estimated by the full information maximum likelihood (FIML) imputation method, which is the best method of treating missing data because it produces the least bias in the missing values (Enders & Bandalos, 2001). Although other methods such as mean imputation and listwise deletion are used to overcome the issue of missing data, they are found problematic (Peugh & Enders, 2004). The advantage of using FIML is that "parameter estimates and standard errors are estimated directly from the observed data in an iterative fashion, rather than being imputed as such" (Marsh & O'Mara-Eves, 2008, p. 58). For data missing at random, FIML is found to produce less biased results when compared with other methods (Hallgren & Witkiewitz, 2013). Questionnaires that contained systematic missing data were treated with listwise deletion during data screening (Kline, 2011). Only a few cases with data missing at random were detected during the screening process.

Congenerity of the PTPE Subscales

The one-factor congeneric models of the six multiple indicator factors of the original version of PTPE were examined. In the models, the loadings of items on the factors they were intended to measure were also examined, and loadings > 0.5 were regarded as "high" (Kline, 1998). Furthermore, each indicator's Square Multiple Correlation (SMC), which is equivalent to item reliability in classical test theory were examined, where values less than 0.5 indicate the item is a weak measure of the construct (Kline, 2011). To improve model fit, the model-trimming strategy (Kline, 1998) was employed when there was a need. This involves eliminating paths that cause the model misfit, however this step was not employed purely based on statistical criteria in order not to cause Type 1 errors. Therefore, any removal of such paths was guided by theoretical considerations and subject to review of the subject experts.

Reliability Tests

Internal consistency reliability was estimated using Cronbach's alpha. Indicators with a Cronbach's alpha above 0.70 were accepted as indications of an adequate measure (Hills, 2008).

Confirmatory Factor Analysis

Full multi-factor confirmatory factor analysis (CFA) was employed to the test construct validity of the factors and, to test the hypothesised factorial structure of PTPE (see Figure 2 in the appendix). Multiple fit indices were examined across both incremental and absolute indices, such as the χ^2/df ratio, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) were examined. For this study, χ^2/df values less than 3 and CFI and TLI values greater than 0.90 were considered as *acceptable fit*. For RMSEA, a value of 0.05 indicated a *close fit*, values near 0.08 indicated a *fair fit*, and values above 0.10 indicated a *poor fit* (Byrne, 1998).

Factor loadings of the items were scrutinised to confirm the hypothesised six-factor structure of PTPE. The proportion of variance explained by the model was also verified, values larger than 25% were considered a "large" effect as per guidelines (Hills, 2008, p. 72).

Convergent and Discriminant Validity

Convergent validity within a construct is a measure of the strength of the relationships between the items that are predicted to represent the construct (Brown, 2006). High or moderately high intercorrelations among the indicators measuring the same construct support *convergent validity* within the construct.

Assessing discriminant validity between constructs is imperative where the constructs in a scale are interrelated. Discriminant validity tests whether the indicators for two constructs are different enough to conclude that they do indeed measure two separate constructs. If there is definitional overlap between the constructs, it could be concluded that the indicators measure a single construct rather than two. The frequently used tests (such as correlational and factor method approaches) are weak or less stringent (Holmes-Smith, 2011). For example, large correlations between constructs (greater than 0.80 or 0.90) have identified as a lack of discriminant validity (e.g. Kline, 1998), however such rules become arbitrary when two constructs are theoretically highly interrelated yet two distinct constructs. This was a critical step in the scale development, as the Standards have high overlapping among them.

In this study, Bagozzi, Yi and Phillips' (1991) nested model method, which is a robust SEM technique to test the extent to which the constructs in a model are different was used. In this rigorous approach to discriminant validity, two nested models were run; namely a model with unconstrained correlation between any two pair of constructs and a second model with constrained correlation between the same constructs (constrained to 1.00). If the χ^2 difference test shows that constraining the correlation between the two constructs does not significantly worsen the model fit, then we fail to conclude that the constructs differ (Bagozzi & Phillips, 1982, p. 476). Since we had six constructs in this scale, we did a similar analysis on each pair of constructs.

Invariance Testing

The purpose of invariance testing is to compare across distinct groups to assess whether the instrument may hold the same meaning for all groups (Byrne, 1998). Invariance testing was conducted to determine whether the instrument measures the same components of *teacher preparedness*, *engage* and *self-efficacy*, with equal validity for various groups (e.g. males and females). To determine whether the invariance testing supplied a satisfactory result, the goodness of fit indices of the nested models with progressive increments of parameter restrictions, usually on the factor loading, factor variances and covariances and, factor uniqueness (Byrne, 1998) were examined (Byrne & Watkins, 2003). Variations in the CFI index less than 0.01 were set as the minimal requirement for factorial invariance, with any variation in RMSEA or TLI were considered arbitrary in nature (Marsh, Tracey, & Craven, 2006).

Results

Congenerity of the PTPE Subscales

One-factor congeneric models of the six multiple indicator latent factors were conducted with data collected from time-point 1. The procedure of model re-specification is outlined below.

Relation

The fit indices of the one-factor congeneric model for *relation* with all items included indicated poor fit (RMSEA =0 .183, CFI = 0.819, TLI = 0.728). The lowest Square Multiple Correlation (SMC) was identified as 0.254 for Q2.1.2 (*Build rapport with students/children*). Large correlation residuals were found between this item and other items in the model. Upon inspection of this item, it was concluded that that respondents might have found this item too broad to give it a specific meaning. It was reasonable to assume that this item had been subjected to differing interpretations by the participants from what was originally intended. Therefore, Q.1.2 was removed and fit indices were examined. Similarly, Q.1.5 had a SMC of 0.267 which was below the cut off limit (0.3), probably because there are two dimensions, therefore the item was also deleted. The respecified model showed *excellent* fit indices (RMSEA =0 .000, CFI =1.000, TLI = 1.001) to the data. The RMSEA value does not mean a *perfect fit* in this instance (Kline, 2011) but generated due to the smaller χ^2 statistic (0.202) of the model than its degrees of freedom (df = 4) (Steiger, 2000).

Knowledge

The model with all items included indicated a *poor* fit (RMSEA = 0.114, CFI = 0.921, TLI = 0.895). The possible sources of model misspecification were identified in the largest correlation residual between Q2.2.2 and Q2.2.8 and between Q2.2.7 and Q2.2.8. Similar large residual correlations were observed between Q 2.2.7 and Q2.2.5. Items Q.2.2.7 and Q.2.2.8 also displayed the lowest SMCs among the indicators (0.366 and 0.353 respectively). Closer inspection of these items revealed the possible reasons for misfit. The phrasing of the item Q.2.2.2 might have made it difficult for respondents to give a single response. Similarly, Q.2.2.7 and Q.2.2.8 were the only two items in the subscale that centred around specific strategies while other items were focusing on general curriculum. The model with Q2.2.2, Q2.2.7 and Q2.2.8 removed showed an *excellent* fit (RMSEA =0.013, CFI = 1.000, TLI = 0.999).

Strategies

The fit indices of the model for *strategies* with all items indicated a *poor* fit (RMSEA =0.126, CFI = 0. 926, TLI = 0. 901). Q.2.3.2 showed the lowest SMC (0.433). Large correlation residual was reported between Q.2.3.2 and items Q 2.3.3, Q2.3.4 and Q.2.3.9. The respecified model with Q.2.3.2 removed showed improved fit (RMSEA = 0.047, CFI = 0.993, TLI = 0.988). A closer inspection of Q.2.3.2 suggested that this item might have been ambiguous for the respondents, perhaps too general to allow participants to attribute a precise meaning to it. This could be a possible reason why Q 2.3.2 failed to fully measure the construct it was intended to measure. Hence, the removal of this item was warranted.

Environment

The original model for *environment* showed a *poor* fit (RMSEA = 0.212, CFI = 0.861, TLI = 0.791) when all items were included. Q 2.4.5 reported the lowest SMC (0.389) and displayed large error variance correlations with Q 2.4.6 and Q 2.4.7, suggesting the item is a weak direct measure the construct. This item was found to highly correlated to other items

meaning that it manifests through other items in the subscale. The respecified model without Q2.4.5 showed *excellent* fit indices (RMSEA =0.039, CFI = 0.998, TLI = 0.994) to the data.

Engage

The fit indices of the original *engage* model with all items indicated a poor fit (RMSEA = 0.133, CFI = 0.943, TLI = 0.920). The lowest SMC (0.529) was reported for Q 2.5.1 and large correlation residuals were observed between this item and Q 2.5.7, Q2.5.5 and Q2.5.2. Closer inspection of the item indicated that the item probably is redundant. Therefore, this item was deemed not to be measuring *engage* as intended and hence, it was removed. The fit of the model with remaining items were *acceptable* (RMSEA = 0.061, CFI = 0.994, TLI = 0.986).

Self- Efficacy

The fit indices of the original *efficacy* model with all items indicated a *poor* fit (RMSEA = 0.101, CFI = 0.915, TLI = 0.872). The lowest SMC was reported for Q 3.3.5 (0.023) and Q3.3.2 (0.112). Closer inspection revealed that they were negatively phrased items on the subscale and this might have led respondents to misinterpretation. Studies show that method effects are associated with negatively worded items (see DiStefano & Motl, 2009) further supporting their removal. The model with these items removed showed an *excellent* fit (RMSEA = 0.028, CFI = 0.998, TLI = 0.995).

Reduction of the scale items from 58 to 36 was not expected to affect the face and content validity of the instrument. To the contrary, the removal of items due to potential misinterpretations, redundancy, or being overly specific supports the objective for each set of subscale items to collectively measure the intended variable. Explanations for why these items were poorly fitting were considered before their deletion from the subscales and were subjected to the review of the research team, consisting of teacher educators with expertise across K-12 grade bands.

Cronbach's Alpha Reliability Estimation of the PTPE

Reliability tests were conducted on the subscales of refined 36-item PTPE. The Cronbach's alpha coefficients were clearly higher than the target reliability of 0.7 (Table 4).

Construct	Alpha
Relation	0.815
Knowledge	0.883
Strategies	0.923
Environment	0.901
Engage	0.929
Self- Efficacy	0.809

Table 4: Cronbach's Alpha Coefficients of PTPE Subscales

Confirmatory Factor Analysis (CFA) of PTPE

The full CFA was conducted on the refined PTPE (see Figure 2 in the Appendix). This model resulted in a *good* fit to the data (RMSEA =0.055; χ^2/df = 1.715; TLI =0.922; CFI =0.931). All indicators specified to measure a common underlying factor demonstrated high loadings (> 0.5) as displayed in Table 5. In addition, the analysis of Modification Indices (MI) of the model did not show any justification for further modification (Byrne, 1998) to the factorial structure of the PTPE. The proportion of variance explained by the model was found as "large" (Hills, 2008, p. 72).

	Relation	***Knowledge***	***Strategies***	***Environment***	***Engage***	***Self-Efficacy***
Factor loadings	0.670	0.633	0.731	0.739	0.795	0.674
	0.706	0.742	0.787	0.835	0.840	0.754
	0.623	0.786	0.768	0.684	0.804	0.728
	0.751	0.795	0.740	0.758	0.822	0.676
	0.743	0.708	0.753	0.835	0.786	
		0.754	0.774	0.695	0.815	
			0.786		0.801	
			0.742			
Average variance explained	26%	26%	33%	38%	68%	27%

Table 5: Factor Loadings of Indicators on PTPE Subscales

Between-factor correlations of the six constructs of PTPE displayed high values (see Table 6) as expected, as four of them were conceptualised as four dimensions of *teacher preparedness*. To examine the discriminant validity of the factorial structure further, Bagozzi et. al's (1991) nested model testing method was employed with each pair of constructs. Table 7 displays the results of comparison with the constrained model, assuming model unconstrained to be correct.

	Relation	***Knowledge***	***Strategies***	***Environment***	***Engage***	***Self-Efficacy***
Relation	1.000					
Knowledge	0.676	1.000				
Strategies	0.599	0.814	1.000			
Environment	0.579	0.603	0.790	1.000		
Engage	0.397	0.469	0.581	0.611	1.000	
Self- Efficacy	0.463	0.579	0.618	0.678	0.577	1.000

Table 6: Correlations Among the Six Latent Variables of PTPE

Pair of variables	df	χ^2	p
relation-knowledge	1	114.664	.000
relation-strategies	1	119.100	.000
relation-environment	1	108.875	.000
relation-engage	1	96.445	.000
relation-efficacy	1	146.226	.000
knowledge-strategies	1	89.970	.000
knowledge-environment	1	99.310	.000
knowledge-engage	1	55.749	.000
knowledge-efficacy	1	126.125	.000
strategies-environment	1	80.388	.000
strategies-engage	1	70.772	.000
strategies-efficacy	1	117.959	.000
environment-engage	1	57.393	.000
environment-efficacy	1	95.188	.000
engage-efficacy	1	75.119	.000

Table 7: Discriminant Validity - Model Comparison of Nested Models (Unconstrained and Constrained)

Constraining the correlation to 1.00 had made the model fit significantly worse than the unconstrained model for each pair of constructs, which convincingly demonstrate the discriminant validity among the six PTPE subscales.

Factorial Invariance Testing of the PTPE by Gender Groups.

Five models were tested for factorial invariance of the measurement model across gender (see Table 8). Examining the variation in the CFI for the nested models, as recommended by Cheung and Renvold (2002), it was identified that invariance across the male and female groups was achieved for the factor loading (Model 2), for the factor loading, variance and covariance (Model 3) and factor loadings and uniqueness (Model 4). The results demonstrated the factor structure of PTPE is invariant across the two critical gender groups for this data; males and females.

Although PTPE was found gender invariant, results were interpreted with caution. Statistical tests have limited power with small sample sizes, and violations of invariance might not be detected if the sample sizes of the two groups are severely unbalanced, thus yielding inconclusive results (Yoon & Lai, 2018). However, the ratio of the size of two groups were around 3 in this study. Therefore, the imbalance was not regarded as ‘substantial’ (Yoon & Lai, 2008 p.209), and the inference was deemed to be correct.

	Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA
1	Completely free	1892.003	1114	1.698	0.884	0.898	0.048
2	Invariant factor loading	1911.325	1144	1.671	0.889	0.899	0.047
3	Invariant factor loading, variance & covariance	1929.172	1165	1.656	0.891	0.899	0.047
4	Invariant factor loadings and uniqueness	1991.792	1223	1.629	0.896	0.899	0.046

Table 8: Factorial Invariance across Gender for the PTPE

Note. χ^2 = chi-square; df = degrees of freedom; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation.

Discussion

Psychometric Properties of the Instrumentation

PTPE was developed with the intention to create a parsimonious instrument that measures PSTs' perception of *preparedness*, readiness to *engage* with the profession and *self-efficacy* in classroom teaching and the relationship among the variables. The results suggest the refined 36-item PTPE is a psychometrically sound, valid, and robust measure of the constructs included in the model. The subscales were congeneric measures of the specified constructs included in the PTPE and the internal consistency reliability for each of the subscales was acceptable. The construct validity (including content, convergent and discriminant validity), and invariance of the factorial structure across male and female genders were also verified.

Implications for Practitioners

This instrument could be used by teacher educational practitioners to examine the effectiveness of their programmes in developing their students' sense of preparedness across various dimensions of teaching. In Australia, initial teacher education providers have professional experiences at various times during their programmes (Ure, et al.,2017). The intention of PTPE scale is best served when it is used during the final professional experience before graduation. Although variables of this instrument were organised under Australian Professional Standards for Teachers, they encompass wide-ranging elements of quality initial teacher education, therefore the instrument can be used in international context as well. Caution should be applied in interpreting the results as this instrument does not measure the quality of the programmes nor provides an accurate measure of the excellence of the future teachers they are preparing. Instead, it is indicative of the perceived preparedness of emerging teachers, which is found to significantly correlated with their sense of teaching efficacy (Darling-Hammond et al., 2002).

Furthermore, data collected employing PTPE could test the empirical viability of the theoretically developed research model (Figure 1). The strength of the hypothesised relations among the constructs can indicate the relative importance PSTs place on the Standards that they presume to enhance their readiness and self-efficacy. This would

enable the initial teacher education programmes to produce teachers who feel better prepared to enter teaching. Validation of the model prior and post the professional experience can be conducted and significance of the path coefficients can be compared using SEM technique. This can make an important contribution to teacher education literature. Such an investigation can pinpoint any shift in PSTs' views on relative significance of Standards on their classroom readiness before and after their professional experience. This comparison can also inform whether the perceived levels of preparedness, engagement and teaching efficacy drop or increase when PSTs encounter reality and, if yes, the reasons for such variations. This information may provide future directions for teacher education programmes.

Appendix

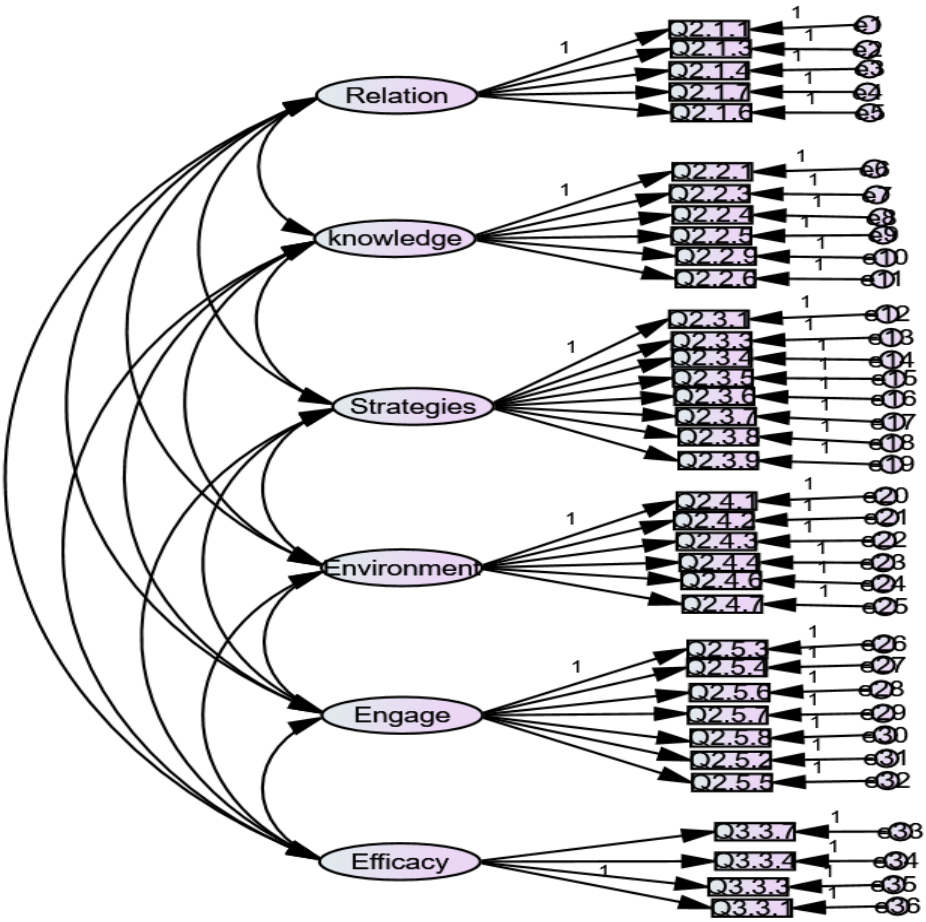

Figure 2: Full CFA of PTPE

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