

Measuring Teacher Educators' Researcherly Disposition: Item Development and Scale Construction

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Abstract This study reports on the development of a self-reported measurement instrument – The Teacher Educators' Researcherly Disposition Scale (TERDS) – to improve understanding of teacher educators' researcherly disposition. Teacher educators' researcherly disposition refers to the habit of mind to engage with research – both as consumers and producers – to improve their practice and contribute to the knowledge base on teacher education. Taking into account the shortcomings of the emerging field of teacher educator professional development research (which is largely confined to small-scale, qualitative studies), a large-scale quantitative survey study ($n=944$) was conducted. The first part of the article reports the results of factor analysis (EFA and CFA), which suggest a four-factor structure of teacher educators' researcherly disposition: (1) 'valuing research' ($\alpha = .86$), (2) 'being a smart consumer of research' ($\alpha = .89$), (3) 'being able to conduct research' ($\alpha = .82$), and (4) 'conducting research' ($\alpha = .87$). Goodness of fit estimates were calculated, indicating good fit. The second part of the article explores differences in teacher educators' researcherly disposition across several subgroups of teacher educators using the developed instrument. Results indicate that having research experience leads to significantly higher scores on each of the subscales. Furthermore, significantly higher scores were found for those with more than 3 years' experience as a teacher educator, as well as for those without (prior) teaching experience in compulsory education. To conclude, the implications for further research and practices related to teacher educators' professional development are discussed.

Keywords Teacher educators · Researcherly disposition · Professional development · Measurement instrument · Teacher education

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Introduction

Teacher educators – those who teach the teachers – had been largely ignored in international research literature, policy documents and practice until the beginning of the twenty-first century (European Commission 2013; Lunenberg et al. 2014). In this respect, Lanier and Little (1986) describe teacher educators as ‘*a breed apart*’ (p.12), and argued that ‘*while it is known that a teacher educator is one who teaches teachers, the composite of those who teach the teachers is loosely defined and constantly changing*’ (p.6). Despite the urgent need to improve the quality of teachers and teaching worldwide (e.g., Cochran-Smith and Zeichner 2005), the preparation, organisation and professional development of those responsible for training teachers seems to have been rather neglected (e.g., Bates et al. 2011; Smith 2003). Teacher educators’ professional development is often quite individualised, ad-hoc and organised by chance (Loughran 2006; Smith 2010). Moreover, it seems that many teacher educators have to shape their own professional learning trajectory, which frequently leads to ‘*reinforcement of past (familiar) practices, maintaining loyalty with particular communities, rather than becoming part of a new community of teacher educators with a distinct focus on teaching about teaching*’ (Berry 2013, p.6).

One possible explanation for why there is no clear career trajectory for teacher educators (in terms of preparation, entry pathways, induction programmes and formal professional development initiatives) lies in the frequently heard – but wrong – assumption that a teacher educator is a professional who is ‘accidentally’ teaching his/her subject on a teacher education programme instead of teaching in primary or secondary schools or in higher education (Berry 2007; Zeichner 2005). Countering this misunderstanding, Murray and Male (2005) conceptualise teacher educators as ‘second-order practitioners’ or ‘teachers of teachers’ with ‘second-order knowledge’ who are teaching in ‘second-order contexts’. This means that, other than teachers in compulsory and higher education, teacher educators are teaching teachers *about* teaching (the subject matter of teaching) and how this subject matter is taught (the pedagogical approach) (Loughran and Berry 2005; Loughran 2006). In this respect, the nature of teacher educators’ work is distinctive, because they must function on multiple levels simultaneously. This means that they have to practice what they preach through modelling and making implicit aspects of their practice explicit for their students (Loughran and Berry 2005).

The goal of this study is to present the development of a measurement instrument that facilitates a better understanding of teacher educators’ professional development. First, a theoretical framework is presented in which teacher educators’ researcherly disposition (Tack and Vanderlinde 2014) is presented as a concept for enhancing understanding about teacher educators’ professional development. Next, the methodology and the findings of the study are presented. Taking into account the shortcomings of prior research on teacher educators’ professional development which is largely confined to small-scale qualitative studies (e.g., Lunenberg et al. 2014), a large-scale quantitative study with 944 institution-based teacher educators was conducted, resulting in a (1) self-reported measurement instrument of Teacher Educators’ Researcherly Disposition (TERDS), and (2) an exploration of differences in teacher educators’ researcherly disposition across several subgroups of teacher educators with different

background experiences (teaching experience in compulsory education, length of service as a teacher educator and research experience) and professional work contexts (type of teacher education institution).

Theoretical Framework

In this article, and framed within the adult theory of transformative learning (Mezirow 1991) and the cognitive theory on dispositions (Perkins et al. 1993), it is suggested to conceptualize teacher educators' professional development as a transformative journey with a focus on developing a researcherly disposition. Transformative learning has been first introduced by Mezirow (1991) as a change process that transforms perspectives or frames of reference; *'the structures of assumptions through which we understand our experiences. They selectively shape and delimit expectations, perceptions, cognition and feelings'* (Mezirow 1997, p.5). According to the transformative learning theory, learning is initiated with a disoriented experience or *'an event that typically exposes a discrepancy between what a person has always assumed to be true and what has just been experienced, heard or read'* which works as *'a catalyst for transformation'* (Cranton 2002, p.66). Transformative change can be the result of a dramatic experience or the product of a series of events over a longer period of time (Mezirow 1997). This is an on-going dynamic process which can occur when new situations arise or when one encounters new information. Notwithstanding their background (e.g., as a teacher in compulsory education, as a researcher or someone with other relevant experiences for the teacher educator profession), becoming a teacher educator is often also experienced as a disorienting dilemma (Murray and Male 2005). In this respect, teacher educators – all over the world – describe their first years as a teacher educator as *'thrown in the deep end'* (Wilson 2006) with *'feelings of professional unease and discomfort'* (Murray and Male 2005) and a process of *'feeling deskilled and disoriented'* (Berry 2013). Teacher educators often perceive their previous professional experiences and knowledge as unsupportive for their new role as a teacher educator and hold different perceptions of their tasks and requirements on how to engage in teacher education practices (Lunenberg et al. 2014):

'My approach to teaching teachers relied on sharing my practical wisdom of 'what worked' in my high school classroom. However, I soon realised that such an approach was neither viable (student teachers could not simply reproduce what I did), nor desirable (student teachers should not be expected to take on my values as their own). This situation created a sense of dissonance in me. It seemed that my professional experiences and knowledge of teaching high school students has limited usefulness in successfully enacting my new role.' (Berry 2013, p. 12)

Teacher educators will thus have to renegotiate deeply-held ideas to their work – that have been acquired in previous professional contexts – towards new frames of references, fitting their new professional role of being a teacher educator (Berry 2013; Loughran 2014). As has been stated before, teacher educators' role lies mainly in being a second-order practitioner or a 'teacher of teachers'. In order to become this second-order practitioner, developing one's role as a researcher is often promoted (Lunenberg et al. 2014; Loughran 2014). Engagement in research is inherently linked to the improvement of the teacher educator profession by

focussing on (1) the improvement of one's own practice as a teacher of teachers, and (2) the further development of the public knowledge base on teacher education. Teacher educators should be able to conduct research into their own practices; become 'smart' consumers of research (meaning that they have to use existing research, but also be able to critically evaluate it); and value the relevance of research for the teacher educator profession (Loughran 2014). In this respect, the process of becoming a teacher educator should be perceived as a '*research journey*' (Loughran 2014, p.2), with research as a means to both structure and advance knowledge about teacher education. However, research engagement cannot be considered as an obviously existing part of every teacher educators' practice. In this respect, most teacher educators find it hard to identify themselves as someone with a research role (Lunenberget al. 2014). Moreover, some teacher educators have already developed expertise as a researcher before or during their work as a teacher educator, while others have not.

When it concerns professionals' individual development and their transformation of frames of references in new vocational practices, several authors have emphasized the central role of dispositions (Perkins et al. 1993; Billett 2005, 2008). Dispositions – as an active and executive component of cognitive processes – are an important explanatory basis in shaping how individuals think, act and play a key role in how individuals tackle problem-solving activities in their vocational practice (Billett 2008). A disposition is broadly defined in cognitive psychology as a tendency or habit of mind towards particular behaviour (Katz and Raths 1985). Perkins et al. (1993) argue there are three psychological components in developing a disposition: (1) sensitivity or the person's alertness to X-occasions; (2) inclination or the felt tendency toward behaviour X; and (3) ability or the basic capacity to continue with behaviour X (Perkins et al. 1993). Dispositions are always grounded in personal histories and affected by both earlier and current socially-derived experiences (Billett 2008). This means that previous experiences and work contexts affect the development of an individual's dispositions. In this respect, professional development within a new professional work context is – in the first place – not about changing the acquired knowledge and concepts itself, but rather transforming their underpinning dispositions (Billett 2008). Similarly, Loughran (2014) emphasizes the role of teacher educators' dispositions and argues '*when realized, [they] drive a teacher educator's mission in ways that can create greater clarity and a greater likelihood of better aligning teaching intents and actions—a professional learning outcome that fundamentally impacts personal professional development*' (p.9).

Inspired by the theory of transformative learning, the cognitive psychological theory on dispositions and taking into account the clear demand of developing one's role as a teacher educator-researcher, teacher educators' researcherly disposition is introduced as a concept to increase understanding of teacher educators' professional development. This concept, which is closely related to concepts such as '*inquiry as stance*' (Cochran-Smith and Lytle 2009) and '*inquiry habit of mind*' (Bruggink and Harinck 2012), has been defined as teacher educators' habit of mind to engage with research – as both consumers and producers of research - to improve their practice and contribute to the knowledge base on teacher education (Tack and Vanderlinde 2014).

Teacher educators' researcherly disposition can be further conceptualised as a theoretical construct encompassing three interrelated dimensions:

- (1) An affective dimension or '*an inclination towards being a teacher educator-researcher*' (Tack and Vanderlinde 2014). This refers to the extent to which a teacher educator values his/her role as a teacher educator-researcher. The affective dimension includes not only valuing engagement with research as a teacher educator, but also believing it is crucial to the teacher educator profession.
- (2) A cognitive dimension or '*the perceived ability to be a teacher educator-researcher*' (Tack and Vanderlinde 2014). The cognitive dimension reflects a teacher educator's perceived ability to engage with research as both a consumer and a producer of knowledge. This means that teacher educators have to be – at least – well informed about teacher education research, know what it means to be involved in research as a teacher educator (including how to use, evaluate, critique and interpret research), and be able to conduct research in a manner that contributes to knowledge in the field of teacher education (Cochran-Smith 2005; Loughran 2014).
- (3) A behavioural dimension or '*the sensitivity to be a teacher educator-researcher*' (Tack and Vanderlinde 2014). This dimension relates to a teacher educator's tendency to engage in research activities as both a consumer and producer of knowledge. On the one hand, this means that teacher educators are inclined to read and use existing research on teacher education to inform their practice. On the other hand, teacher educators need to conduct research into their own practice to produce both local knowledge and public knowledge relevant to teacher education (Cochran-Smith 2005).

Research Purpose

Taking into account the shortcomings of prior research on teacher educators' professional development (e.g., Lunenberg et al. 2014), the purpose of the present study is to enhance empirical understanding of teacher educators' researcherly disposition (Tack and Vanderlinde 2014). The current study approaches this goal by two phases. The first phase of the study involved the development of a self-reported measurement instrument for evaluating teacher educators' researcherly disposition based on a large scale survey study with 944 Flemish teacher educators. In the second phase of the study, teacher educators' researcherly disposition was explored using the developed instrument to test hypothesized differences across subgroups with different background experiences (teaching experience in compulsory education, research experience, length of service as a teacher educator) and professional work contexts (type of teacher education institution). Based on the theories of transformative learning (Mezirow 1991) and the research on dispositions (Billett 2008; Perkins et al. 1993), an influence of personal histories and professional work contexts can be expected. In particular, and also taking into account the existing research literature on teacher educators' professional development, it can be hypothesized that:

1. Teacher educators with research experience will have higher scores than teacher educators without research experience (e.g., Lunenberg et al. 2014);
2. Teacher educators with more than 3 years of service as a teacher educator will have higher scores than teacher educators with less experience (e.g., Murray and Male 2005);
3. Teacher educators professional work context can lead to differences in teacher educators' researcherly disposition (e.g., Lunenberg et al. 2014);
4. Teacher educators with teaching experience might have lower scores compared to teacher educators without teaching experience (e.g., Berry 2013; Lunenberg et al. 2014).

Method

Research Context

Teacher education in Flanders (the Dutch-speaking part of Belgium) is provided by three different types of higher education institutions: colleges of higher education (CoHE) ('Hogeschole'), centres for adult education (CfAe) ('Centra voor Volwassenenonderwijs') and universities ('Universiteiten'). The teacher education programmes offered by these institutions all result in the same teaching certificate, but whereas CoHE and CfAe offer professional training in teacher education, universities offer research-based academic training in teacher education. Even though CoHE have recently started to develop research expertise, the main responsibility of teacher educators in a professional programme in a CoHE or CfAe is the education of future teachers. Teacher educators occupied at a university are often academic researchers with minor teaching responsibilities. Given these structural differences and the fact that their main occupation of being a researcher, teacher educators working at universities were excluded from this study.

Participants

All teacher education programmes organised by CoHE ($n=50$) and CfAe ($n=21$) in Flanders were contacted to participate in the survey study. Only four teacher education programmes organised by CfAe and seven organised by CoHE opted not to participate in the study (due to lack of time and other priorities). Teacher educators from participating institutions were asked to fill in a questionnaire so scales could be constructed in the next step of the research. As an incentive to participate, a comprehensive feedback report was promised if at least 70 % of the teacher educators at the corresponding institution completed the survey. Only teacher educators with a teaching responsibility were asked to participate. Considering fairness of testing (e.g., AERA APA NCME 2015), teacher educators were given the choice between filling in an online survey or a paper-and-pencil version of the questionnaire.

Questionnaire data were collected from a sample of 944 institution-based teacher educators, resulting in a response rate of 70 %. Twenty-one questionnaires contained missing values (2.2 % of the gross total received).

Phase 1

In order to conduct the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), the total sample ($n=944$) was randomly divided into two equal groups using the odds and evens split method (Tabachnick and Fidell 2007). The first subsample ($n=472$) included 74.8 % female and 25.2 % male respondents. The average length of employment as a teacher educator in the first subsample was 11.2 years, varying from 2 months to 37 years. 81 % of teacher educators in this subsample had no appointment as a researcher within the teacher education institution; however, 38.3 % of the teacher educators mentioned having other relevant experience with research (e.g., during their Bachelor degrees, from attending professionalisation courses on practitioner research, or from having obtained a doctoral degree). The second subsample ($n=472$) included 75.8 % female and 24.2 % male teacher educators. Their average length of employment as a teacher educator was 10.7 years, varying from 2 months to 38 years. In this subsample, 82 % had no current appointment as a researcher within their teacher education institution, but 34.5 % had other relevant experience with research as a teacher educator.

Phase 2

The total sample ($n=944$) was used to investigate differences in teacher educators' perceived researcherly disposition across several subgroups. The sample included 75.3 % female and 24.7 % male respondents. The average length of service as a teacher educator was 10.9 years, varying from 2 months to 38 years. A minority (18.5 %) had an appointment as researcher within their teacher education institution, while approximately one third (36.3 %) reported having relevant experience with research as a teacher educator.

Procedure

Phase 1

Based on the previously described theoretical framework for the development of teacher educators' researcherly disposition (Tack and Vanderlinde 2014), 24 items for evaluating researcherly disposition were formulated, since no appropriate scales have appeared yet in the literature (Lunenburg et al. 2014). All items were independently evaluated by 12 experts and stakeholders in the field of teacher education (both researchers and teacher educators) to evaluate their content validity and clarity. This screening process resulted in an item bank with 24 items, accompanied by a Likert-type answer format. All three dimensions of the framework (affective, cognitive and behavioural) were covered in the questionnaire, with eight items dedicated to each.

Respondents were asked to rate each item separately on a six-point agree-disagree continuum: 0 = Strongly Disagree, 1 = Disagree, 2 = Slightly Disagree, 3 = Slightly Agree, 4 = Agree, 5 = Strongly Agree. No uncertain or neutral position was presented in order to force an agree/disagree rating. The term 'research' was also defined in the survey, thereby ensuring that all teacher educators participating would understand this concept in a similar way. We defined research as 'the systematic investigation into and study of materials and sources in order to develop knowledge, new theories or answer questions occurring from practice or policy'. Furthermore, we elaborated on this

definition by providing examples of research conducted by teacher educators (see [Appendix A](#) for an example of our measurement instrument with instructions).

Phase 2

In order to be able to compare the mean scores of the latent constructs across different groups of teacher educators, it is necessary to test for measurement invariance. Tests for measurement invariance investigate whether an instrument measures the same constructs with the same structure across different groups. If this assumption is true, comparisons are valid and differences between groups can be meaningfully interpreted. If, however, the assumption is not true, comparisons are not meaningful. As such, establishing measurement invariance is a prerequisite for meaningful comparisons across groups (Milfont and Fisher 2010).

Statistical Analysis

Phase 1

The scale construction involved several subsequent steps: (1) an EFA to identify the number of factors, (2) a CFA to examine the stability of the exploratory factor structure, and (3) a reliability analysis to determine the internal consistency of the scales.

For the EFA, an exploratory principal axis factoring analysis was performed, with a promax rotation used to allow correlation between the factors. Several criteria for determining the number of factors were considered: Kaiser's criterion (1960) to retain eigenvalues bigger than one, Cattell's scree test (1966), Horn's parallel analysis (1965), and Velicer's MAP (O'Connor 2000). Following the recommendations of Hair et al. (2006), all items with loadings of .50 and less were excluded from further analysis. Item(s) were also removed where the factor loadings differed by 0.25 or less on two factors. Such items were considered to have cross-loadings (Nunnally and Bernstein 1994; Tabachnick and Fidell 2007).

For the CFA, several fit indices were calculated to determine the adequacy of the fitted model: (a) the χ^2 and p-value, (b) the comparative fit index (CFI), (c) the Tucker-Lewis index (TLI), (d) the root mean square error of approximation (RMSEA), and (e) the standardised root mean square residual (SRMR). Following Hu and Bentler (1999), cut-off values of $\leq .06$ and $\leq .08$ for RMSEA and SRMR respectively indicate a good fit. CFI and TLI scores $\geq .90$ indicate adequate fit, while scores of $\geq .95$ indicate a good fit.

To test the internal consistency of the instrument, Chronbach's alpha was calculated. Factors with an α of 0.80 are considered reliable (Tabachnick and Fidell 2007).

Phase 2

After scale construction, tests of measurement invariance (configural, metric and scalar) were performed across four groups (length of service as a teacher educator, research experience, teacher education institution, and experience as a teacher). Measurement invariance can be established by testing the equivalence of factor loadings and thresholds successively (Muthén and Muthén 2011). To determine measurement invariance across subgroups in large samples, it is preferable to report the change in CFI and

RMSEA between the unrestricted and restricted models instead of the difference in Chi-square statistics (Chen 2007; Cheung and Rensvold 2002). Cheung and Rensvold (2002) recommend using a ΔCFI value higher than .01 to indicate a significant drop in fit. Additionally, Chen (2007) suggests using $\Delta RMSEA$ to test for evidence of invariance. The criteria for invariance are $\Delta CFI \leq .01$, $\Delta RMSEA \leq .015$.

The tests of latent mean differences were conducted for the groups in which scalar invariance was observed. Assessment of latent mean differences is based on the critical ratio (CR) index, where $CR \geq 1.96$ indicates significant differences in the means. The Cohen's d effect size index was also calculated to interpret the magnitude of the mean differences (.20 = small differences, .50 = medium differences, .80 = large differences) (Cohen 1988).

SPSS 22.0 was used for the EFA and for the internal consistency analysis. MPlus 7 (Muthén and Muthén 2011) was used for the CFA, the tests of measurement invariance and the tests of latent mean differences.

Results

Phase 1: Item Development and Scale Construction

Exploratory Factor Analysis

An exploratory principal axis factoring analysis was performed on the data for the first sample ($n = 472$) to investigate the underlying structure of the 24 items in the developed scale. Based on the first analysis, four items were deleted due to loadings across factors or low communality values. The second analysis was conducted on the remaining 20 items using a promax rotation (oblique rotation), which allows factors to be correlated. As advised by O'Connor (2000), varied standards were used to determine how many factors would be retained, with the eigenvalues-rule and the scree test both suggesting a four-factor solution. Since these standards sometimes overestimate the number of factors to withhold, a parallel analysis and Velicer's MAP were also conducted. Both tests confirmed the four-factor solution.

The eigenvalues are 7.81, 2.53, 1.80 and 1.06 respectively. Table 1 presents the results of this exploratory factor analysis, in which 20 items load on four factors.

The first of the four factors developed is '*being a smart consumer of research*' and assesses the degree to which a teacher educator uses existing research to inform his/her own practice. The second factor is '*being able to conduct research as a teacher educator*' and refers to the extent to which a teacher educator thinks he/she is capable of conducting research into teacher education. The third factor is '*valuing research as a teacher educator*' and measures the extent to which a teacher educator esteems research-oriented approaches towards his/her daily practice and, as such, recognises his/her role as a researcher. The fourth factor is '*conducting research as a teacher educator*' and refers to the degree to which a teacher educator is actively conducting research into teacher education.

Confirmatory Factor Analysis

A confirmatory factor analysis was conducted to evaluate the stability of the four-factor structure with the second sample ($n = 472$). The final model comprises six items for

Table 1 Results of the exploratory factor analysis (EFA) ($n = 472$)

Item	F1	F2	F3	F4
<i>As a teacher educator...</i>				
1 I often read research literature in educational journals	.74	.37	.27	.41
2 My teaching is informed by research	.79	.28	.23	.35
3 I systematically improve my own practice based on research literature	.91	.29	.27	.45
4 I am inclined to use research literature to solve problems in my teaching practice	.60	.24	.29	.30
5 I am familiar with recent research literature concerning the education of future teachers	.72	.35	.25	.43
6 I am able to show students the influence of research literature on my teaching practice	.81	.48	.29	.43
7 I have enough methodological knowledge to autonomously go through a research cycle (e.g., ask a research question, gather data, analyse and report data, etc.)	.35	.78	.36	.49
8 I am capable of presenting and sharing my own research results with other teacher educators (e.g., at conferences and in journals)	.28	.81	.38	.54
9 I am someone who is capable of conducting research	.39	.86	.38	.56
10 I do not know how to fulfil my role as a teacher educator-researcher	.30	.60	.32	.25
11 Teacher educators have a responsibility towards their students to study their own practice	.28	.30	.57	.26
12 Research is essential for the teacher education profession	.33	.35	.77	.42
13 A teacher educator who does not recognise his/her role as a researcher is not a good teacher educator	.19	.24	.79	.29
14 Teacher educators' role as a researcher has to be one of the most important ones.	.25	.37	.78	.43
15 Every teacher educator should regularly conduct research to improve their practice	.24	.44	.76	.49
16 Teacher educators should conduct research to contribute to the wider knowledge on teacher education	.22	.32	.69	.43
17 I conduct research to improve my own practice	.46	.49	.44	.76
18 I have experience with conducting research as a teacher educator	.45	.50	.47	.87
19 I conduct research in order to develop knowledge relevant to other teacher educators	.38	.59	.47	.83
20 I present at conferences and seminars to share my own research results	.42	.38	.41	.71

The numbers in bold represent the factor loadings linked to each factor, respectively F1, F2, F3 and F4 (e.g. item 1 to 6 load on F1).

'being a smart consumer of research', six items for 'valuing research as a teacher educator', four items for 'being able to conduct research as a teacher educator' and four items for 'conducting research as a teacher educator' (see Fig. 1). The results show a good fit between the hypothesised model and the observed data ($\chi^2 = 329.6$, $df = 162$, $\chi^2/df = 2.03$, $p = 0.0000$). The overall model fit was assessed using the χ^2 test; however, because of its sensitivity to sample size (almost always significant when you have a large sample), other goodness-of-fit were also used (Muthén and Muthén 2011). The goodness of fit estimates were CFI = .96, TLI = .95, SRMR = .04 and RMSEA = .047, with a 90 % interval of .040 and .055, indicating good fit. The results suggest that all items load significantly onto the four latent factors. All coefficients were between .53 and .89 and differed significantly from zero at the .001 level. Correlations between the four factors were high (between .49 and .77) and significant.

As can be seen in Fig. 1, we allowed the residuals (ϵ) to correlate for one pair of items in the 'valuing research as a teacher educator' factor (ϵ_{15} and ϵ_{16}). We also allowed

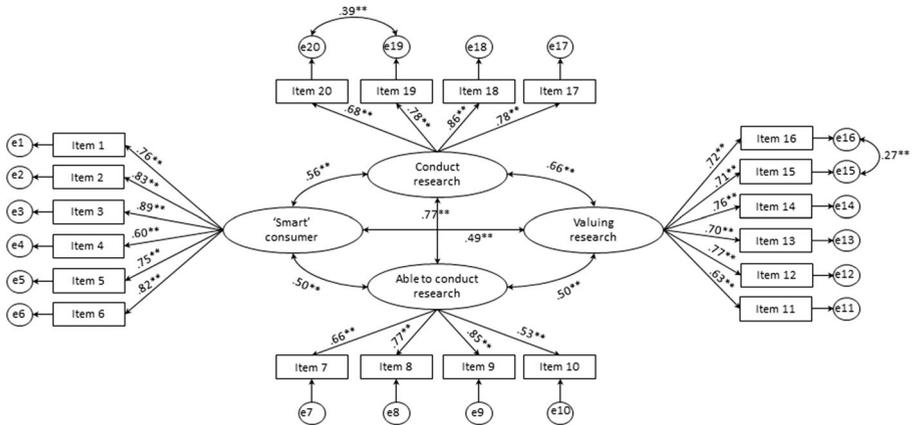


Fig. 1 Results of the CFA on items related to teacher educators' researcherly disposition, ** $p < .001$

residuals to correlate for one pair of items in the 'conducting research as a teacher educator' factor (e19 and e20). This led to a decrease in χ^2 (from 390.3 to 329.6) compared to the model without correlated residuals. Correlated residuals suggest a substantial overlap between two items. Items 15 and 16 in the 'valuing research as a teacher educator' subscale both have a clear focus on teacher educators' attitudes towards actively conducting research, while the remaining items in the factor more broadly assess teacher educators' attitudes about being a teacher educator-researcher (including being a 'smart' consumer of research). Items 19 and 20 in the 'conducting research as a teacher educator' factor are both specifically related to actively conducting research in order to contribute to the public knowledge base on teacher education, while the remaining items refer to improving one's practice as a teacher educator. Allowing the correlations of these residuals is recommended in several methodological papers and handbooks on educational research (e.g., Cole et al. 2007; Tabachnick and Fidell 2007) because they reflect intended features of the research design.

Reliability Analysis and Descriptive Statistics

A reliability analysis was performed on the complete data set ($n=944$) to examine the internal consistency of the four factors. The newly constructed scales ('conducting research as a teacher educator', 'being able to conduct research as a teacher educator', 'valuing research as a teacher educator' and 'being a smart consumer of research') were all found to be highly reliable, with Chronbach's alphas (α) of .87, .82, .86 and .89, respectively (see Table 2). Table 2 further presents the mean score (M) and standard deviation (S.D.) for each subscale, ranging from a minimum score of zero to a maximum of five.

Phase 2: Measurement Invariance and Latent Mean Differences

Measurement Invariance

In order to enable comparison of the mean scores of the latent constructs across different groups of teacher educators, it was necessary to test for measurement

Table 2 Chronbach's alphas and descriptive statistics of the newly constructed scales

	α	M	$S.D.$
Being a smart consumer of research	.89	2.74	1.14
Being able to conduct research as a teacher educator	.82	2.87	0.84
Valuing research as a teacher educator	.86	2.68	1.09
Conducting research as a teacher educator	.87	2.04	0.99

invariance. If measurement invariance is achieved, researchers can accept that different groups of individuals interpret the items and their underlying constructs in similar ways. Three levels of measurement invariance are described (from less constrained to more constrained): (1) configural invariance, (2) metric invariance, and (3) scalar invariance. When configural invariance (1) is achieved, factor loadings on each of the constructs can differ across groups. If only configural invariance is established, it would indicate that teacher educators conceptualise constructs (e.g., conducting research as a teacher educator, being a smart consumer of research, etc.) similarly, but it would not guarantee that individual items are interpreted in the same way. Metric invariance (2), meanwhile, indicates that factor loadings are equal across groups and that items are therefore interpreted in a similar way. However, if the goal is to compare means of latent constructs across groups (as in this research), (3) scalar invariance is needed. If scalar (or measurement) invariance is achieved, differences in means of the observed items can be interpreted as a consequence of the differences in the means of the latent constructs.

The current study attempted to establish scalar invariance between: (1) teacher educators with ≤ 3 years of service and teacher educators with ≥ 3 years of service as a teacher educator; (2) teacher educators with teaching experience and teacher educators without teaching experience in compulsory education; (3) teacher educators working in CfAe and those working in CoHE; and (4) teacher educators without research experience and teacher educators with research experience (see Table 3).

To investigate measurement invariance, the change in CFA and RMSEA when the unrestricted and the more restricted model was assessed. The criteria for invariance were $\Delta CFI \leq .01$ and $\Delta RMSEA \leq .015$ (Chen 2007; Cheung and Rensvold 2002). As Table 3 shows, scalar invariance is suggested for all groups, including research experience, type of institution, length of service, and (prior) teaching experience in compulsory education. This means that teacher educators across the studied groups interpret our measurement instrument in a consistent manner and that the mean scores of the latent constructs can be compared.

Test of Latent Mean Differences

The test of latent mean differences is used to compare responses between subgroups. In testing for latent mean differences, the estimated mean of one group will be compared to zero, representing the other group. In the present study, teacher educators (1) with ≤ 3 years of service, (2) with no experience as a teacher in compulsory education, (3) working in a CoHE and (4) with no research experience were the reference groups for (1) length of service as a teacher educator, (2) teaching experience in compulsory education, (3) teacher

Table 3 Results of the tests of measurement invariance by (1) type of teacher education institution, (2) research experience, (3) length of service as a teacher educator, and (4) teaching experience in compulsory education

	Model Fit Indices				Model Comparisons		
	χ^2 (df)	CFI	TLI	RMSEA	Comparison	Δ CFI	Δ RMSEA
<i>(1) Type of teacher education institution</i>	Model 1 (configural invariance)	.952	.944	.050			
	Model 2 (metric invariance)	722.66 (340)*	.951	.945	Model 2 vs. Model 1	.001	.000
	Model 3 (scalar invariance)	779.40 (356)*	.945	.942	Model 3 vs. Model 2	.006	.001
<i>(2) Research experience</i>	Model 1 (configural invariance)	667.88 (356)*	.949	.940			
	Model 2 (metric invariance)	683.10 (340)*	.949	.943	Model 2 vs. Model 1	.000	.001
	Model 3 (scalar invariance)	781.94 (356)*	.939	.933	Model 3 vs. Model 2	.010	.004
<i>(3) Length of service as a teacher educator</i>	Model 1 (configural invariance)	718.95 (324)*	.949	.94			
	Model 2 (metric invariance)	735.09 (340)*	.949	.943	Model 2 vs. Model 1	.000	.001
	Model 3 (scalar invariance)	798.45 (356)*	.943	.939	Model 3 vs. Model 2	.006	.002
<i>(4) Teaching experience in compulsory education</i>	Model 1 (configural invariance)	691.59 (136)*	.955	.947			
	Model 2 (metric invariance)	692.13 (120)*	.954	.949	Model 2 vs. Model 1	.001	.001
	Model 3 (scalar invariance)	414.69 (104)*	.953	.950	Model 3 vs. Model 2	.001	.001

* $p < .05$ / With (1) 709 working in a CoHE and 190 working in a CfAe; (2) 746 teacher educators with no research experience and 163 teacher educators with research experience; (3) 192 teacher educators with ≤ 3 years of service and 699 with > 3 years of experience; and (4) 514 teacher educators with teaching experience in compulsory education and 356 without teaching experience in compulsory education – Criteria for invariance model comparison: Δ CFI $\leq .01$, Δ RMSEA $\leq .015$

education institution, and (4) research experience respectively. Comparisons of latent mean differences do not enable estimation of the absolute mean in each group, but rather present the mean difference in the latent variables between the groups. Assessment of latent mean differences was based on the critical ratio (CR) index, where $CR \geq 1.96$ indicates significant differences in the means. A positive CR value suggests that the comparison group has higher latent mean values than the reference group.

To interpret the mean differences in terms of their magnitude, the effect size index Cohen's d is reported (Cohen 1988). Table 4 shows the results of the tests of latent mean differences for each factor. Teacher educators with research experiences ($n = 163$) have significantly higher scores on each of the subscales compared to their counterparts ($n = 746$) (t between 5.649 and 12.89). The effect size of the mean difference in '*being a smart consumer of research*' is moderate ($d = .60$), but the effect sizes of the mean differences on the other subscales are large (all $d \geq .80$). Considering their years' of experience, those with more than 3 years' experience as a teacher educator ($n = 699$) have lower scores for '*valuing research as a teacher educator*' and '*being able to conduct research*' and higher scores for '*being a smart consumer of research*' and '*conducting research*' than their counterparts ($n = 192$). However, only the mean differences in '*being a smart consumer of research*' ($t = 2.229$, $p < .05$) are statistically significant, with the difference having a small effect ($d = .11$). Teacher educators with teaching experience in compulsory education ($n = 514$) were found to have lower scores on each of the subscales. However, only the mean differences in the factor '*conducting research as a teacher educator*' were statistically significant ($t = -2.338$, $p < .05$), with the difference having only a small effect ($d = .25$). Between teacher educators working in CoHE ($n = 709$) and those employed at CfAe ($n = 190$), the latter scored significantly lower on the subscale '*conducting research as a teacher educator*' ($t = -2.332$, $p < .05$). As above, the effect size was small ($d = .25$).

Discussion & Conclusion

Having conducted one of the first large-scale quantitative survey studies on teacher educators' professional development ($n = 944$), this article presents a measurement instrument (TERDS) to measure teacher educators' self-reported researcherly disposition throughout their working lives. This concept, defined as teacher educators' habit of mind to engage with research as both consumers and producers to improve their own practice and contribute to shared knowledge, offers a promising approach to the professional development of teacher educators (Tack and Vanderlinde 2014).

In the first phase of the study, EFA, CFA and reliability analyses were conducted so that four different factors could be identified: (1) '*valuing research as a teacher educator*', (2) '*being a smart consumer of research*', (3) '*being able to conduct research*', and (4) '*conducting research as a teacher educator*'. Goodness of fit estimates were calculated, all indicating good fit. The first of the factors above refers to the extent to which a teacher educator values his/her role as a teacher educator-researcher. The second reflects the degree to which a teacher educator is able to use existing research to inform his/her practice. The third scale pertains to the extent to which a teacher educator is capable of conducting research into teacher education.

Table 4 Test of latent mean differences for (1) type of teacher education institution, (2) research experience, (3) length of service as a teacher educator, and (4) type of teacher education institution

Construct	χ^2	χ^2/df	TLI	CFI	RMSEA	SRMR	MD	CR (t)	d
<i>(1) Type of teacher education institution</i>	Able to conduct research	779.40	.94	.95	.051	.048	-0.027	-0.317	
	Conducting research						-0.242	-2.332*	.25
	Valuing research						-0.010	-0.129	
<i>(2) Research experience</i>	'Smart' consumer of research						0.082	0.856	
	Able to conduct research	781.94	.93	.94	.051	.052	0.902	12.42*	1.31
	Conducting research						1.612	12.89*	1.37
<i>(3) Length of service as a teacher educator</i>	Valuing research						0.584	7.47*	0.79
	'Smart' consumer of research						0.493	5.649*	0.60
	Able to conduct research	798.45	.94	.94	.048	.052	-0.114	-1.307	
<i>(4) (Prior) teaching experience in compulsory education</i>	Conducting research						0.110	1.077	
	Valuing research						-0.106	-1.373	
	'Smart' consumer of research						0.206	2.229*	.11
	Able to conduct research	714.68	.95	.95	.048	.050	-0.088	-1.204	
	Conducting research						-0.204	-2.338*	.25
	Valuing research						-0.072	-1.113	
'Smart' consumer of research						-0.018	-0.252		

* $p < .05$; MD: mean difference, significant if score is bigger than +/- 1.96; d = Cohen d effect size with .25 'small difference', .50 'medium difference', and .80 'large differences'

Finally, the fourth scale contains items concerning whether or not a teacher educator is actively conducting research into teacher education.

The four-factor structure does not fully align with the theoretically assumed three-dimensional structure. Interestingly, we found that the two scales – ‘*being able to conduct research*’ (cognitive dimension) and ‘*conducting research*’ (behavioural dimension), both of which related to teacher educators’ role as producers of research – could not be combined as a single factor. Further research is thus needed to determine why teacher educators who perceive themselves as capable and ready to conduct research as a teacher educator still do not do so. Reporting on the influence of dispositions on professionals working lives, Billett (2008) argues that dispositions may lead professionals to withhold from putting their capabilities (i.e., being able to conduct research) into action (i.e., conducting research as a teacher educator).

In the second phase of the study, tests for measurement invariance were conducted on the four factors in the TERDS, providing support for full configural, metric and scalar invariance by length of service as a teacher educator, research experience, experience as a teacher and teacher education institution. Teacher educators reported a generally low to neutral level of researcherly disposition on the TERDS instrument. As could be expected (Lunenberg et al. 2014; Cochran-Smith 2005), teacher educators with research experience score significantly higher on each of the four subscales compared to their counterparts without research experience. Furthermore, in line with previous research (Murray and Male 2005), teacher educators with > 3 years of experience score significantly higher on the subscale ‘*being a smart consumer of research*’. Working in a College of Higher Education or having no prior experience as a teacher in compulsory education, moreover, led to significantly higher scores on the subscale ‘conducting research as a teacher educator’.

The factor analysis and the internal consistency analysis provides some first evidence on the internal structure of our instrument (AERA APA NCME 2015). We were also able to establish measurement invariance. In this respect, the current study examined the comparability of the factor structures of the TERDS between four subgroups of teacher educators. Moreover, relevant subgroups’ scores were compared were investigated based on hypothesized differences (AERA APA NCME 2015). In this respect, this study also provides first steps in validating our instrument. However, the validation process never ends, and future research could possibly focus on response processes or consequences of use or can be related to objective measures of teacher educators’ professional qualifications. Furthermore, we want to stress that our test scores are intended to be interpreted as measuring teacher educators’ self-reported researcherly disposition, which clearly differs from instruments focussing on the assessment of competences or learning outcomes (e.g., COACTIV studies on teacher competence) (AERA APA NCME 2015; Kane 2013).

Further research is required, as this study is subject to a number of limitations and still leaves several issues untouched. First, we have to be aware that the outcomes of the TERDS instrument remain self-reported measures. This implies that teacher educators’ answers may have been influenced by social desirability, as is a risk with any form of subjective data collection (Desimone 2009). However, throughout the process of survey development and administration, several steps were taken to reduce social desirability bias. This included extensive piloting, critical reviews and pretesting by an expert group of researchers and teacher educators. Moreover, we assured respondents in the introduction of our survey that there were ‘no right or wrong answers’ and guaranteed

absolute confidentiality. In this respect, our data collection was trustworthy and not linked to the teacher educators' workplace evaluation, which reduces the incentive for respondents to misrepresent themselves (AERA APA NCME 2015).

A second limitation of this study was that the measurement instrument developed was tested for teacher educators working on professional teacher education programmes (e.g., at CoHE and CfAe). Teacher educators working in these contexts are not typically expected to publish work in relevant academic and professional journals (this is also the case in most European countries; see Lunenberg et al. 2014). Rather, they were mostly educated to be a teacher and got 'promoted' to being a teacher educator. However, in Pacific Rim contexts and the United States, teacher educators are usually educated to be a researcher in a particular area – e.g., psychology, mathematics or languages – and their job at a university includes teaching teachers (see Hamilton and Clandinin 2011; Snoeck and Zogla 2009). Testing the structure of our measurement instrument in a university context could further improve its international applicability. Furthermore, we also believe that it would be valuable to test our measurement instrument for applicability among other professional educators in higher education. In particular, this instrument has potential to serve occupational groups such as, for instance, academics who educate doctors, nurses and social workers. Like many teacher educators, these professionals also exchange their status as day-to-day practitioners in their original setting for work as educators in higher education institutions (Murray and Male 2005). As knowledge and understanding of higher education-based professional education and professional educators is still in its developmental stage (Watson 2000), we strongly recommend a further exploration of this area. In this respect, our items are already formulated to be fairly broad, which facilitates adaptation to new contexts.

Finally, in this article, only a few variables have been related to the TERDS. In the future, we intend to add several additional variables related to the organisational context and personal histories of teacher educators (e.g., research culture and infrastructure of the institution and the motivation of individual teacher educators). (Multilevel) Structural Equation Modelling can be used to help further clarify the relationship between these variables and teacher educators' self-perceived researcherly disposition. In these studies, our newly constructed scales can serve as the dependent variables. Moreover, it would be interesting to conduct intervention studies (e.g., to assess the impact of a professionalisation course) into the conditions (both personal and contextual) under which teacher educators' researcherly disposition changes.

Even though research on teacher educators' professional development has increased over the past decade, most of these studies have been small-scale qualitative studies (Lunenberg et al. 2014). This study clearly tackles this gap by presenting the results of a large-scale quantitative survey based on a self-reported measurement instrument designed to empirically describe teacher educators' self-reported researcherly disposition. Moreover, by using the instrument to explore differences between several subgroups of teacher educators, this study enhances empirical understanding of a previously '*undiscovered*' and '*neglected*' professional group. Finally, given the general character and the overall reliability of the measurement instrument, the same scales could be translated and used to examine other vocational practices.

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Appendix A: Example of TERDS with instructions

In this survey research is defined as ‘the systematic investigation into and study of materials and sources in order to develop (1) knowledge, new theories or answer questions occurring from (2) practice or (3) policy’. Research conducted by teacher educators can be practitioner research, practice-based research, research and development projects, policy-related research and fundamental research. Answer each of the statements.

---	--	-	+	++	+++
Totally disagree	Disagree	Rather disagree	Rather agree	Agree	Totally agree

<i>As a teacher educator...</i>		---	--	-	+	++	+++
1	I have enough methodological knowledge to autonomously go through a research cycle (e.g., ask a research question, gather data, analyse and report data, etc.)						
2	My teaching is informed by research						
3	Research is essential for the teacher education profession						
4	I am inclined to use research literature to solve problems in my teaching practice						
5	I conduct research to improve my own practice						
6	Teacher educators have a responsibility towards their students to study their own practice						
7	I often read research literature in educational journals						
8	I am capable of presenting and sharing my own research results with other teacher educators (e.g., at conferences and in journals)						
9	I am someone who is capable of conducting research						
10	I am familiar with recent research literature concerning the education of future teachers						
11	I am able to show students the influence of research literature on my teaching practice						
12	A teacher educator who does not recognise his/her role as a researcher is not a good teacher educator						
13	I systematically improve my own practice based on research literature						
14	Teacher educators' role as a researcher has to be one of the most important ones.						
15	Every teacher educator should regularly conduct research to improve their practice						
16	I conduct research in order to develop knowledge relevant to other teacher educators						
17	I do not know how to fulfil my role as a teacher educator-researcher						
18	I have experience with conducting research as a teacher educator						
19	Teacher educators should conduct research to contribute to the wider knowledge on teacher education						
20	I present at conferences and seminars to share my own research results						

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