

ASSESSING TEACHERS' PROFESSIONAL IDENTITY IN A POST-SECONDARY INSTITUTION IN SINGAPORE

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Abstract: This study reports an empirical study on the development and validation of a scale to assess post-secondary teachers' professional identity. A sample of 352 teachers from a post-secondary education institution in Singapore voluntarily participated in this study. The sample was randomly split into two sub-samples, Sample 1 ($N = 185$) and Sample 2 ($N = 167$). Exploratory factor analysis (EFA) was conducted in Sample 1 to determine the number of factors and select the items. Confirmatory factor analysis (CFA) was conducted in Sample 2 for cross-validation to confirm the factorial structure of the scale and examine the model-data fit. Both EFA and CFA results provided support for a three-factor scale structure. The three sub-scales were: teaching beliefs (5 items); professional socialisation (4 items); and career progression (3 items). Each sub-scale showed good internal consistency reliability and predictive validity. Potential uses of the scale in educational research and practice were discussed.

Keywords: professional identity; teacher development; factor analysis; validation, post-secondary education, scale development

1. INTRODUCTION

In the past two decades, many post-secondary education institutions worldwide have been facing a rising level of expectations from various stakeholders to develop a skillful workforce that can meet the challenges of the fast-changing business environments driven by the advancements of science and technology in an increasingly globalised economy (Bakah, Voogt & Pieters, 2012; Whitchurch & Gordon, 2010; Viskovic, 2006). The imperative to keep pace with industry demands and to improve the academic quality of post-secondary education has also triggered an increased attention to examine the teaching quality and the professional capacity of post-secondary teachers in the pursuit of educational goals (Bakah et al., 2012; Beauchamp & Thomas, 2009; Clarke, Hyde & Drennan, 2013). In particular, many educational policy makers and scholars see the importance of investing in the professional development of post-secondary teachers to enhance their capacities to impart knowledge and skills to their students (Välilmaa & Neuvonen-Rauhala, 2008; Viskovic, 2006; Whitchurch & Gordon, 2010). In addition, they also noted that it is equally important to cultivate a sense of identity among the post-secondary teachers towards their profession and organisation (Välilmaa & Neuvonen-Rauhala, 2008; Viskovic, 2006). It is felt that the post-secondary teaching fraternity needs to meet new expectations in several areas, namely: the possession and use of specialist knowledge, a long period of training and socialisation into the attitudes and behaviours expected of the teaching profession, and the use of discretion and professional judgment where members of the teaching profession have discretion and make value judgements rather than just apply rules to a routine set of circumstances (Knight, Tait, & Yorke, 2006; Simmons & Thompson, 2007). Essentially, how post-secondary teachers perceive themselves as teaching professionals of the 21st century can have significant influence on their work motivation and attitudes (Day, Stobart, Kington, Sammons, & Last, 2003; Flores & Day, 2006; Hodkinson, 1997).

While teacher education research in primary and secondary education levels has reported that professional identity is a key driver which could affect how primary and secondary teachers teach, how they develop professionally and how they approach educational changes (Cardelle-Elawar, Irwin & Sanz de Acedo Lizarraga, 2007; Cheung, 2008; Day, 2002; Young & Erickson, 2011), comparatively, there is limited empirical evidence to understand post-secondary teachers' professional identity and how it might affect their motivation towards their work roles. One possible reason might be due to a lack of psychometrically sound measures of professional identity specific to the post-secondary education setting, given that most of the professional identity scales developed in educational settings are primarily used for assessing teachers' professional identity at the primary and secondary education levels (Cardelle-Elawar et al., 2007; Cheung, 2008; Izadinia, 2013). As such, there is therefore an

empirical need to develop a more relevant psychometric scale to assess post-secondary teachers' professional identity to advance research and practice.

The current study had two objectives. First, it aimed to identify the dimensions of professional identity among a sample of teachers in a post-secondary education institution in Singapore. Second, it aimed to develop and validate a professional identity scale for assessing the post-secondary teachers' professional identity. The scale could serve as a measuring tool to enable both educational researchers and teacher educators at the post-secondary education level to develop a better understanding of post-secondary teachers' professional identity and its implications for teacher professional development at the post-secondary education level.

2. CONCEPTUALISING PROFESSIONAL IDENTITY OF TEACHING PROFESSIONALS

In recent years, although the call for professionalising the teaching profession at the post-secondary education level has triggered a renewed attention and interest among educational policy-makers, scholars and practitioners to rethink the professional identity of post-secondary teachers in the pursuit of educational excellence (Bakah et al., 2012; Krause, 2011; Trede, Macklin & Bridges, 2012; Whitchurch, 2008, 2010), there is no universally agreed conceptualisation or definition of professional identity of teachers across education levels in the existing literature to date. In fact, the construct of professional identity has been defined and conceptualised differently in different research contexts by different educational scholars (Beauchamp & Thomas, 2009; Beijaard et al., 2004; Trede et al., 2012).

For instance, Collin (2009) argued that professional identity can be broadly defined as one's sense of self that is connected to a particular vocation. On the other hand, Beauchamp and Thomas (2009) contended that professional identity comprises the notion of agency, or the active pursuit of professional development and learning in accordance with a teacher's goals. In this view, teacher professional identity pertains to not only how teachers see themselves as teaching professionals based on their interpretations of their continuing interactions with their social contexts, but also allow them to exercise agency to pursue their goals (Beijaard et al., 2004; Coldron & Smith, 1999; Hong, 2010). According to Britzman (1991), "Learning to teach is not a mere matter of applying decontextualized skills or of mirroring predetermined images; it is a time when one's past, present, and future are set in dynamic tension. Learning to teach - like teaching itself - is always the process of becoming: a time of formation and transformation, of scrutiny into what one is doing, and who one can become" (p. 8). Other scholars view teacher professional identity as a construct of professional self that evolves over career stages and can be shaped by institutions, reform, and political contexts (Schlager & Fusco, 2003; Stronach, Corbin, McNamara, Stark & Warne, 2002). In this view, how teachers define themselves can be viewed as an on-going process of interpretation and reinterpretation of their experiences in the teaching profession (Beijaard et al., 2004; Day, 2002).

Similarly, from a socio-cultural standpoint, scholars have noted that the construction of professional identity is both social and personal (Beijaard et al., 2004; Eteläpelto & Saarinen, 2006; Vähäsantanen, Hökkä, Eteläpelto, Rasku-Puttonen, & Littleton, 2008), often via a process that "emerges through a subject's personal intentions, goals and ideals, all of them being intertwined with the subject's learning through the communities of professional education and working-life experiences" (Eteläpelto & Saarinen, 2006, p. 158). Also opined by Coldron and Smith (1999), understand the concept of professional identity through one's self as a teacher and also by others is important as this could continually help the individual teacher to construct a sustainable professional identity.

From a socio-cultural perspective, a teacher's professional identity is an ongoing, dynamic state of '*being* and *becoming*' which involves constantly questioning oneself: "who am I as a teacher at this moment and who do I want to become as a teacher" (Coldron & Smith, 1999; Connelly & Clandinin, 1999; Goodson & Cole, 1994; Schepens, Aelterman & Vlerick, 2009). From this perspective, a teacher's professional identity is therefore not a stable entity, but rather a state of '*being* and *becoming*' often shaped by contextual factors such as the teachers' interactions with students and colleagues in their social contexts as well as their professional experiences and learning over time (Beijaard et al., 2004). As such, many scholars opined that a teacher's identity can be formed through interaction with others and with the environment (Beijaard et al., 2004; Korthagen 2004; Van Veen, Slegers, & Van de Ven, 2005). This thus means that identity development for teachers involves an understanding of the self and a notion of that self within an outside context, such as a classroom or a school, necessitating an examination of the self in relation to others (Beauchamp & Thomas, 2009).

Despite slight variations in its conceptualisation, from an extensive review of existing literature, it was found that four core dimensions of professional identity could generally be identified across educational settings that may constitute teachers' professional identity. These four core dimensions are: teaching beliefs, professional competence, professional socialisation, and career progression.

2.1 Teaching Beliefs

Teachers' professional identity is believed to be shaped by many factors and scholars have identified teachers' beliefs towards teaching and learning as one of the crucial factors (de Vries, van de Grift, & Jansen, 2013, 2014; Minor, Onwuegbuzie, Witcher, & James, 2002). This is because, very often, teachers use their personal interpretative framework of beliefs and values to express how they see themselves as teachers (Minor et al., 2002; Pajares, 1992). As a result, teachers' perceptions of themselves as teachers are coloured by their personal educational beliefs. From the perspective of professional self, a teacher's beliefs and values in education can play a critical role in a teacher's identity formation in the sense that it is believed to strongly determine how teachers teach, how they develop professionally and how they approach educational changes (Beijaard et al., 2004; de Vries et al., 2013; Ibarra, 1999). According to Ibarra (1999), professional identity refers to "the constellation of attributes, beliefs, values, motives, and experiences in terms of which people define themselves in a professional role." (p. 764-765). Also pointed out by Akkerman and Meijer (2011), teachers' beliefs about teaching and learning tend to direct teachers' actions and their perception of themselves in their function as teachers. This also means that a teacher's identity is often based on the core beliefs that one has about teaching and being a teacher, and these beliefs are continuously formed and reformed through experience. As a result, the functional competencies of being a teacher are developed differently, often being shaped by the individual's evolving perspectives, beliefs and philosophies of teaching (Korthagen, 2004). As noted by Hargreaves (1998), teachers are passionate beings and teaching involves human nurturance, connectedness, warmth and love. Oftentimes, a teacher's professional philosophy is mediated by his or her personal belief system (Hargreaves, 1998), and therefore each teacher's individual beliefs about their role in caring for students form a crucial part of their identity (O'Connor, 2008). Thus, from this perspective, the concept of teacher identity has both reflective and active dimensions which encompass both the teacher's professional philosophy and actions (O'Connor, 2008). In other words, the uniqueness of every teacher's approach to teaching is often shaped by their personal beliefs and values about teaching, and in this sense, reflection on one's own perceptions, beliefs, experiences and practices is a core activity for all teachers (Walkington, 2005). In essence, a focus on self is central to teacher identity as it shapes what he or she will be as a teacher, what and how he or she will teach, and how he or she will respond to the changing context of teaching (Timoštšuk & Ugaste, 2010).

2.2 Professional Competence

In the educational settings, it is generally agreed that professionally competent teachers require a deep and full understanding of the subject area they teach as well as pedagogical knowledge to understand how students learn so as to better cater to their needs (Battay & Franke, 2008; Cheung, 2008; Enyedy, Goldberg & Welsh, 2006). Specifically, from the perspective of professional roles, Enyedy et al. (2006) state that teacher professional identity can be seen in terms of teachers' professional practices or actions (what they do) and professional roles (who they are). This notion is also supported by Andrzejewski (2009) who examined the relationships among teacher identity, knowledge, and teacher practices in a recent study which suggested that teachers' professional identity is a combination of what they know (curriculum expertise) and the pedagogy they use to put it into practice. In fact, many scholars (Beijaard, Verloop & Vermunt, 2000; Chai, Koh & Tsai, 2010; Cheung, 2008; Darling-Hammond, 2006) have contended that to develop into competent teaching professionals, teachers must do well and have knowledge in the following areas: subject matter and curriculum goals (educational goals and purposes for skills, content and subject matter), teaching (content plus content pedagogy, teaching diverse learners and assessment and classroom management) and students' development in a social context (learning, human development and language). In other words, both deep subject knowledge and pedagogical content knowledge (PCK) are needed, as well as the knowledge of new technologies applied to subject teaching (or termed Pedagogical Technical Content Knowledge, PTCK) in this digital age (Chai et al., 2010; Cheung, 2008; Koehler & Mishra, 2009; Mishra & Koehler, 2006). In particular, with the shift from the traditional teacher-centric conceptions of teaching towards more student-centric learning approaches in the 21st century classrooms, a teacher is expected to be more of a facilitator of learning and less of a transmitter of knowledge which focuses on the learners' processes of knowledge construction and utilisation (Beijaard et al., 2000; Darling-Hammond, 2006). Essentially, a teacher's professional identity is closely linked with the role of the teacher in the classroom as well as directly linked with the 'craft' of teaching, that is the teacher's competence in his or her professional knowledge and skills (Hagger & McIntyre, 2006). As Hamachek (1999) contends, "Consciously, we teach what we know; unconsciously, we teach who we are." (p. 209).

2.3 Professional Socialisation

According to several scholars (Browne-Ferrigno & Muth, 2004; Price, 2009), professional socialisation is an essential process of learning skills, attitudes and behaviours necessary to fulfill one's professional role. Often, teachers' professional socialisation is more than just acquiring the skills and knowledge necessary to perform a work

role, but it also includes an understanding of the values and norms that are fundamental to the essence of the teaching profession (Browne-Ferrigno & Muth, 2004; Flores & Day, 2006). In fact, many scholars have contended that teachers' participation in social interaction or affiliation, especially in the form of communities of practice or professional learning communities, is fundamental to the process of identity development (Beijaard et al., 2004; Lieberman, 2009; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Wenger, 1998). Particularly, Olsen (2008) views teacher identity as both a product (a result of influences on the teacher) and a process (a form of ongoing interaction within teacher development). According to Olsen (2008), "I view identity as a label, really, for the collection of influences and effects from immediate contexts, prior constructs of self, social positioning, and meaning systems (each itself a fluid influence and all together an ever-changing construct) that become intertwined inside the flow of activity as a teacher simultaneously reacts to and negotiates given contexts and human relationships at given moments (p. 139)". Similarly, Ibarra (1999, 2002) refers to professional identity as one's sense of his or her professional role, and the message he or she conveys about one's self to others. Thus, the formation of professional identity is an ongoing process of integration of the personal and the professional sides of becoming and being a teacher (Beijaard et al., 2004). Essentially, teachers' professional identity can easily be influenced by personal, social and cognitive responses such that the co-construction of professional identity takes place within interpersonal communication (Flores & Day, 2006). As such, it is reasonable to assume that the professional identity of teachers depends on the perception and understanding of the wider professional community (Browne-Ferrigno & Muth, 2004; Eteläpelto & Saarinen, 2006; Van Huizen, Van Oers, & Wubbels, 2005) as construed by Wenger (1998) who views the professional identity of the teacher as the person's self-knowledge in teaching-related situations and relationships that manifest themselves in practical professional activities, feelings of belonging and learning experiences.

2.4 Career Progression

Career progression may be defined in terms of the level and type of positions which teachers move through in the teaching profession which can associate with an increase in salary or the level of responsibility, promotions or professional status (Seibert, Maria & Michael, 2001). From an organisational perspective, the continual support for teachers' development and growth in their teaching career may include more formalised ranks within the teaching profession, such as in the provision of career advancement and professional development opportunities to teachers as well as matching teachers' abilities with ranks and responsibilities within the organisation (Day & Gu, 2007). A clear career path or structure can provide the teachers with a clearer vision and systematic progression for higher quality performance to motivate them to move forward with their career objectives within the profession and organisation. According to Lunenburg and Ornstein (2011), teachers as professionals have to take responsibility for their own employment and development. Hence, in the teaching profession, a 'career ladder' which could provide a mechanism for improved professional image and status would likely empower teachers to make their own career decisions for career advancement and professional growth (Coldron & Smith, 1999; Hodkinson, 1997), thereby enabling teachers to forge greater identification with their profession and organisation (Bogler & Somech, 2004; Lee & Nie, 2014).

2.5 Development of a Professional Identity Scale for Post-Secondary Teachers

As post-secondary teachers play vital roles in providing the industries with skilled workers to support the economic growth, there is a need to enhance post-secondary teachers' professional identity and their teaching quality. Given that most empirical studies of teachers' professional identity are mainly qualitative in nature and the limited number of quantitative measures of teachers' professional identity tends to focus on the primary and secondary teachers, there appears to be a lack of a specific measure for assessing post-secondary teachers' professional identity. This thus signals an imperative need for the development of a new psychometrically sound measure for more specific assessment of post-secondary teachers' professional identity to inform practice. As such, the current study aimed to address the following objectives:

- (1) To identify the dimensions of professional identity among a sample of post-secondary teachers; and
- (2) To develop and validate a professional identity scale for assessing post-secondary teachers' professional identity.

3. METHOD

3.1 Sample

A convenience sample of 352 full-time teachers from a post-secondary education institution in Singapore voluntarily participated in this study. 60.5% of the participants were male and 39.5% were female; 77.3% were Chinese, 6.0% were Malays, 10.8% were Indians and 5.9% were from other minority races; 84.4% of the participants had more than two years of teaching experience; 98.0% had at least a Bachelor degree; and the median age range of participants was between 30 and 40 years old, which constituted 54.3% of the total number of participants.

The total sample of participants ($N = 352$) was randomly split into two samples, Sample 1 ($N = 185$) and Sample 2 ($N = 167$), for performing exploratory and confirmatory factor analyses in the scale development and validation process. Demographic information for Samples 1 and 2 are as follows:

Sample 1 ($N = 185$). 59.5% of the participants were male and 40.5% were female; 74.7% were Chinese, 7.0% were Malays, 13.5% were Indians and 4.8% were from other minority races; 87.0 % of the participants had more than two years of teaching experience; 98.4% had at least a Bachelor degree; and the median age range of participants was between 30 and 40 years old, which constituted 58.4% of the total number of participants.

Sample 2 ($N = 167$). 61.7% of the participants were male and 38.3% were female; 80.2% were Chinese, 4.8% were Malays, 7.8% were Indians and 7.2% were from other minority races; 91.0% of the participants had more than two years of teaching experience; 97.6% had at least a Bachelor degree; and the median age range of participants was between 30 and 40 years old, which constituted 49.7% of the total number of participants.

3.2 Instrumentation and Measures

3.2.1 Item Pool of the Post-Secondary Teachers' Professional Identity (PST-PI) Scale

The item pool was mainly drawn from items selected from the existing measures of professional identity used in various educational settings (Adams, Hean, Sturgis & Clark, 2006; Chai, Koh & Tsai, 2010; Cheung, 2008; Dobrow & Higgins, 2005; Goh, 2011; Norton, Richardson, Hartley, Newstead & Mayes, 2005) as well as newly crafted items based on constructs identified in other empirical studies of professional identity of teachers in various institutions. As many items and factors as possible were included in this item pool, resulting in four identified factors comprising 40 items for further item/factor selection. The number of items comprising each factor are: 10 items for 'Teaching Beliefs', 7 items for 'Professional Socialisation', 15 items for 'Professional Competence' and 8 items for 'Career Progression'. The items identified for the initial four factors of the scale are presented in Appendix A. To ensure content validity, the 40 items were revised by five experienced fulltime post-secondary teachers (each with at least three years of teaching experience) for content, context and language clarity. A 7-point Likert rating scale where 1 represented 'strongly disagree' and 7 represented 'strongly agree' was used for all the items.

3.2.2 Outcome Variables

Based on an extensive review of existing literature, professional commitment and work engagement have been identified as two important outcomes of professional identity among teachers in different research contexts (Day, Elliot & Kington, 2005; Lee & Nie, 2014). To measure professional commitment, we adapted four items from Lee and Nie's (2014) Professional Commitment scale. A sample item was "I stay abreast of developments in my line of work." The Cronbach's alpha coefficient for Professional Commitment scale in the current study was .81. To measure work engagement, seven items from Schaufeli, Bakker and Salanova (2006) Work Engagement Scale were adapted. A sample item was "I am enthusiastic about my job." The Cronbach's alpha coefficient for Work Engagement scale in the current study was .93. The fit indices were: Chi-square, $X^2(43) = 129.367$, $p > .001$; TLI = .957, CFI = .966, RMSEA = .076.

3.3 Data Collection

Ethics approval was obtained from the researchers' affiliated institution prior to data collection. Informed consent was obtained from a post-secondary education institution in Singapore to allow its full-time teachers from eight different academic departments to participate in the study. An anonymous online questionnaire¹ was designed and used for data collection. The link of the online questionnaire was emailed to all the full-time teachers of the participating post-secondary institution together with a cover letter attached to the online questionnaire to explain the objectives of the research and assured anonymity and confidentiality of participation. The duration of the online questionnaire was 15 minutes. Informed consent was obtained from the participants prior to their participation in the online questionnaire and they were assured that they were allowed to withdraw at any time from the research if they wished to. Participants responded to the items on demographic and measures of professional identity, professional commitment and work engagement. Participants' responses were recorded via an online spreadsheet for further analysis.

¹ Participants were not required to identify themselves in this study so as to encourage greater voluntary participation and genuine responses from them.

4. ANALYSES AND RESULTS

4.1 Factorial Structure of the Post-Secondary Teachers' Professional Identity (PST-PI) Scale

Exploratory factor analyses (EFA) and confirmatory factor analyses (CFA) were conducted to evaluate the factorial structure of the PST-PI scale for Sample 1 and Sample 2, respectively. It is clearly using EFA and followed by the use of CFA because EFA can easily identify the items that have cross-loadings or misloadings in other factors, while CFA can help to further cross-validate the factorial structure as well as test the model-data fit (Gerbing & Hamilton, 1996; Worthington & Whittaker 2006).

4.1.1 EFA Using Sample 1 ($N = 185$)

EFA was conducted to select the items from the item pool and assess the factorial structure of the PST-PI scale. Factorability of the correlation matrices was assessed using Bartlett's (1950) test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser & Rice, 1974). Results from the Bartlett's test of sphericity provided support for performing EFA: Chi-square, $X^2(780) = 4935.002, p > .001$. The KMO results for the PST-PI scale was .893, further indicating support for performing EFA. Given the moderately high correlations among the factors, an oblique (Promax) rotation was decided for performing the EFA because the use of oblique rotation rather than orthogonal rotation can reduce the loss of valuable information if the factors are correlated (Costello & Osborne, 2009).

To select and retain items in EFA, three recommendations by methodologists (Comrey, 1988; Floyd & Widaman, 1995; Worthington & Whittaker, 2006) were adhered to, that is to retain items that had (1) factor loadings more than .40, (2) no or the lowest crossloadings on other factors and (3) conceptual consistency with other items on the factor. To determine the number of factors to retain, we adhered to the following four recommended criteria (Noar, 2003; Worthington & Whittaker, 2006): (1) Kaiser's (1960) rule of retaining eigenvalues greater than 1 (K1), (2) Cattell's (1966) scree test, (3) Horn's (1965) parallel analysis using the SPSS macro developed by O'Conner (2000), and (4) conceptual interpretability. Through a series of EFA to select items and retain factors, it was found that the items of the factor 'Professional Competence' did not fit well with the other factors of the PST-PI scale. Finally, the three-factor structure with 12 items showed the best interpretability based on prior theory and it also fitted well with the suggestions by the K1 rule, scree test and parallel analysis for the number of factors to retain for further validation using CFA. The three factors were 'Teaching Beliefs', 'Professional Socialisation' and 'Career Progression' which accounted for 66.87 % of the total variance in PISE. The communalities obtained for this three-factor PST-PI scale ranged from .447 to .903.

Table 1 presents the EFA factor loadings of the 12 items of the three-factor PST-PI scale based on Sample 1 ($N=185$).

Insert Table 1 here.

4.1.2 CFA Using Sample 2 ($N = 167$)

Next, CFA was conducted to confirm the factorial structure of the PST-PI scale in a cross-validated sample, Sample 2. All the three factors were allowed to correlate freely and error terms were left uncorrelated. Table 1 presents the CFA factor loadings of the 12 items of the three-factor PST-PI scale. Model fit was assessed by a number of indices (i.e. Chi-square, X^2 ; degrees of freedom, df ; Tucker-Lewis index, TLI; comparative fit index, CFI; root mean square error of approximation, RMSEA) as different indices reflect different aspects of model fit (Hair, Black, Babin, Anderson, & Tatham, 2006; Hu & Bentler, 1999). A first-order three-factor PST-PI scale structure was tested using CFA and our result indicated that the model-data fit was acceptable (9). Alternatively, a first-order one-factor PST-PI scale structure was tested using CFA but our result showed that the model data fit was poor.

Table 2 presents the fit indices of the first-order one-factor and first-order three factor structure models using Sample 2.

Insert Table 2 here.

4.2 Mean, Standard Deviation, Internal Consistency Reliabilities and Interfactor Correlations Based on the Total Sample ($N = 352$)

Insert Table 3 here.

Sample 1 ($N = 185$) and Sample 2 ($N = 167$) were combined into a total sample ($N = 352$) to calculate the mean, standard deviation, internal consistency reliabilities and interfactor correlations. Each sub-scale of PST-PI was scored by calculating the mean of the items that composed each sub-scale. The internal consistency reliabilities (Cronbach's alpha coefficients) of the three factors based on the total sample ranged from .83 to .89, which were above the recommended level at .70 (Nunnally, 1978). The interfactor correlations among PST-PI sub-scales based on the total sample were positively significant, and ranged between .333 and .569 ($p < .001$). Table 3 presents the mean, standard deviation, Cronbach's alpha coefficients and the interfactor correlations within and between the three-factor PST-PI scale based on the total sample ($N=352$).

4.3 Predictive Validity

All the three PST-PI sub-scales were positively and significantly correlated at $p < .001$ with the outcome variables, professional commitment and work engagement. Table 4 presents the correlations of PST-PI sub-scales with the professional commitment and work engagement scales using the total sample ($N=352$).

Insert Table 4 here.

5. DISCUSSION AND IMPLICATIONS

This study developed and validated the three-factor PST-PI scale to measure the professional identity of post-secondary teachers. It could contribute to a better understanding of the post-secondary teachers' professional identity and development in a number of ways.

First, results from both EFA and CFA provided support for a stable three-factor PST-PI scale structure. Given that the three factors which made up the PST-PI scale were complementary rather than mutually exclusive, the multidimensional feature of the PST-PI scale would be beneficial for educational researchers and practitioners to examine how different dimensions of professional identity might contribute to building post-secondary teachers' professional identity, which in turn, could have impact on their work outcomes, such as their professional commitment and work engagement. This would enable more effective staff development programmes or interventions to be designed with a focus on developing or enhancing the specific dimensions of professional identity of post-secondary teachers.

Second, unlike most of the existing professional identity scales which did not test for predictive validity in their scale development and validation process, the current study tested the predictive validity of this newly developed scale with the theoretically relevant criterion variables, professional commitment and work engagement. Our results indicated that all the three sub-scales of PST-PI were positively correlated with professional commitment and work engagement. Hence, our results indicated that the PST-PI scale is a reliable measure with good predictive validity and could therefore serve as a sound psychometric measurement for measuring professional identity of post-secondary teachers.

Third, an interesting finding which is counterintuitive to previous research on professional identity of teachers is that although teachers' professional practices in terms of their professional competence was reported to constitute professional identity of teachers in a sample of Hong Kong teachers (Cheung, 2008), our results in the current study indicated that the 'professional competence' dimension of the professional identity scale did not fit well with the other dimensions of the current scale. Hence, our results suggest that professional competence might be a separate construct which does not constitute one of the dimensions of professional identity of post-secondary

teachers in the current study. Nevertheless, future research could further explore whether professional competence could possibly be a necessary construct to complement the building of professional identity among post-secondary teachers. Specifically, future research could test whether professional competence and professional identity moderate each other to have an interactive effect on the criterion variables of professional identity such as professional commitment and work engagement. This would allow a reframing of staff development programmes from an exclusive focus on 'doing' the work of a post-secondary teacher toward a broader focus that also includes 'being' a post-secondary teacher.

Fourth, given the limited research on the professional identity of post-secondary teachers at the current moment, this study could contribute empirical insights to inform educational policy-makers in formulating a more holistic professional development framework for post-secondary teachers.

6. LIMITATIONS OF STUDY AND SUGGESTIONS FOR FUTURE RESEARCH

Despite its noteworthy significance, there are also limitations in this study which need to be acknowledged or future research could attempt to address.

First, this study only used a small sample size of teachers in one of the post-secondary education institutions in Singapore, which may not be representative of the population of post-secondary teachers in Singapore. As a result, the generalisability of the results of this study should be interpreted with caution. Larger and multiple samples of teachers across different post-secondary institutions in Singapore should be considered for further validation of the scale in future studies so as to increase the representativeness and generalisability of the findings.

Second, as we were not granted access to the identity and demographic data of all the full-time teachers of the participating post-secondary institution, a convenience sampling design was adopted for data collection in this study. As a result of the convenience sampling design and anonymous nature of the online questionnaire for data collection, we were unable to conduct an accurate check for non-response bias. Future studies may wish to address the issue of non-response bias by having a more robust sampling design and data collection method to increase the reliability and validity of data collected.

Third, cultural differences may play a part in the development of professional identity (e.g., Beijaard et al., 2004). Future studies could consider validating the PST-PI scale using cross-cultural samples for comparison so as to develop a better understanding of the professional identity of post-secondary teachers across various cultural settings.

Fourth, the research design of the current study was cross-sectional in nature and therefore did not consider multi-interval multi-time data collection. As the development of teachers' professional identity is an ongoing, evolving process, it is suggested that future research could consider repeated measures of an individual teacher's professional identity to determine the degree of its possible change and development over time in the teacher's teaching career.

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Table 1. *EFA factor loadings for Sample 1 (N = 185) and CFA factor loadings for Sample 2 (N = 167)*

Factor	Item	Sample 1 (N = 185)	Sample 2 (N = 167)
		EFA Loading	CFA Loading
1. Teaching Beliefs (5 items)	A good teacher is one who provides an environment in which students feel safe to explore and learn.	.843	.784
	A good teacher is one who recognises the learning needs of his/her students.	.830	.865
	A good teacher should encourage active participation from his/her students.	.827	.819
	A good teacher is one who can motivate students to learn.	.689	.792
	A good teacher should have a genuine interest in their students' well-being.	.483	.776
2. Professional Socialisation (4 items)	I share new teaching ideas/knowledge with colleagues.	.885	.737
	I can identify positively with members of the teaching profession.	.830	.781
	I work collaboratively with my colleagues.	.752	.689
	Being a member of the teaching profession is important to me.	.651	.737
3. Career Progression (3 items)	There is a clear career track for teachers in my institution.	.976	.933
	I am clear about the steps to achieve career progression in this institution.	.954	.923
	I have a clear vision of how to become a teaching professional in my institution.	.790	.671

Note. Only EFA and CFA factor loadings greater than .40 are presented.

Table 2. *Fit indices of the two models of the PST-PI scale using Sample 2 (N = 167)*

Fit Index*	Model	
	First-order one-factor	First-order three-factor
X^2	515.072	94.553
df	54	50
p	.001	.001
X^2/df	9.538	1.891
TLI	.539	.954
CFI	.623	.966
RMSEA	.227	.073

*Recommended guidelines for model fit indices (Hair et al. 2006; Hu & Bentler 1999): $X^2/df < 3$; TLI $>.90$; CFI $>.90$; RMSEA $<.08$

Table 3. Mean, Standard Deviation, Internal Consistency Reliabilities and Interfactor Correlations Based on the Total Sample (N = 352)

Factor/Sub-scale	M	SD	Internal Consistency Reliability (α)	Interfactor Correlations		
				1. Teaching Beliefs	2. Professional Socialisation	3. Career Progression
1. Teaching Beliefs	6.49	.63	.87	1		
2. Professional Socialisation	5.95	.80	.83	.569**	1	
3. Career Progression	5.14	1.33	.89	.333**	.483**	1

Note. ** denotes $p < .001$.

Table 4. Correlations of the PST-PI sub-scales with Professional Commitment and Work Engagement (N=352)

PISE Sub-Scale	Bivariate Correlations with	
	Professional Commitment	Work Engagement
1. Teaching Beliefs	.451**	.509**
2. Professional Socialisation	.568**	.609**
3. Career Progression	.445**	.477**

Note. ** denotes $p < .001$.

Appendix A. Items for the initial four factors of the PST-PI scale

Factor	Item
1. Teaching Beliefs (Adapted from Norton, Richardson, Hartley, Newstead & Mayes, 2005)	Q1. A good teacher is one who provides an environment in which students feel safe to explore and learn.
	Q2. A good teacher should encourage active participation from his/her students.
	Q3. Teaching is about providing an environment in which students are encouraged to take ownership of their learning.
	Q4. A good teacher is one who recognizes the learning needs of his/her students.
	Q5. A good teacher should have a genuine interest in their students' well-being.
	Q6. A good teacher is one who can motivate students to learn.
	Q7. A good teacher has to be a subject matter expert.
	Q8. A good education should prepare students for lifelong learning.
	Q9. A good education should prepare students for life.
	Q10. It is essential that teachers use technology to enable students to learn effectively.
2. Professional Socialisation (Adapted from Goh, 2011)	Q1. I can identify positively with members of the teaching profession.
	Q2. Being a member of the teaching profession is important to me.
	Q3. I share new teaching ideas/knowledge with colleagues.
	Q4. I work collaboratively with my colleagues.
	Q5. I participate in professional development/training courses/conferences within and outside my institution.
	Q6. It is important for me to learn from other professional educators within and outside my institution.
	Q7. Staying connected with the industry I previously worked in is important in supporting my professionalism as an educator.

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| 3. Career Progression* | Q1. I am proud to be a teacher.
Q2. Pursuing a career in education is important to me.
Q3. I am given job assignments which help me in my development as a teacher in my institution.
Q4. I have a clear vision of how to become a teaching professional in my institution.
Q5. There is a clear career track for teachers in my institution.
Q6. I am clear about the steps to achieve career progression in this institution.
Q7. My job has high professional status.
Q8. My job as a teacher is well respected by the society at large. |
| 4. Professional Competence
(Adapted from Chai, Koh & Tsai, 2010; Cheung, 2008) | Q1. I have sufficient knowledge about my teaching subject.
Q2. I select appropriate teaching approaches to guide my students' learning.
Q3. I use appropriate technologies (e.g., multimedia resources, games and simulation) to enhance my students' learning.
Q4. I facilitate my students' learning through the use of technology.
Q5. I am able to facilitate my students to collaborate with each other using technology.
Q6. I am able to make active contributions to curriculum decisions.
Q7. I am able to foster a conducive learning environment for my students.
Q8. I am able to help my students apply what they have learnt to real life situations
Q9. I am able to motivate my students in their learning.
Q10. I am able to make active contributions to assessment decisions.
Q11. I use assessment results to improve my students' learning.
Q12. I support the diverse learning needs of my students.
Q13. I build rapport with my students.
Q14. I mentor my students.
Q15. I provide career guidance to my students. |
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*denotes dimension which consists of newly created items.