

Measuring Teacher Dispositions: Identifying Workplace Personality Traits Most Relevant to Teaching Professionals

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What personality traits represent dispositions most relevant to teaching professionals? Could an instrument reflecting work personality traits for a wide variety of professions provide a valid assessment of dispositions for teacher candidates? This study analyzed the internal structure of a state mandated dispositions assessment that was adapted from the Workplace Personality Inventory II. The analyses found that the hypothesized factor structure lacked support from the data. The second stage of the study explored and identified a measurement model consisting of select personality traits most relevant to teaching professionals. The results of the study have implications for educational agencies and teacher education programs interested in the assessment and promotion of dispositions of teacher candidates.

Introduction

In response to President Obama's 2009 *Race to the Top* (RttT) initiative requiring states to track student achievement data for use in evaluating both practicing teachers and educational preparation programs (Edmonds, 2014), the Missouri Department of Elementary and Secondary Education (DESE) started its educational reform initiative, the *Top 10 by 20* program, in the same year. The initiative was aimed at improving student achievement statewide over the coming decade and improving Missouri's educational standing as compared to other states (Missouri Department of Elementary and Secondary Education, 2014). The third goal of the *Top 10 by 20* program—to prepare, develop, and support effective educators—coincided with the RttT initiative of using new standardized tests or revised testing practices. DESE implemented these assessments as necessary tools to support improvement of teacher quality and for collecting the data that RttT now mandated.

Missouri Educator Profile

One assessment introduced as part of the overhaul in Missouri educator preparation was the Missouri Educator Profile (MEP) (Pearson, 2015). This test, developed by Pearson under contract with DESE in 2013, was designed to “measure a person's work style as it relates to the field of education” (Missouri Department of Elementary and Secondary Education, 2013, p. 2). Preservice teachers are required to take the online test from any internet-connected computer, review an instantly generated MEP Development Report, discuss the report with their academic advisors, and use the results of the report to develop an improvement plan (Hairston, 2014). The

MEP consists of 192 questions that represent statements of preference on a 4-point rating scale representing Strongly Disagree (1), Disagree (2), Agree (3), and Strongly Agree (4), respectively. For instance, a survey question about attention to detail is “I have a reputation for carefully checking details.” A question about stress tolerance is “others have said that I am calm under stress.”

The survey takes approximately 30 minutes to complete at the cost to the student of \$22 per administration. The MEP was originally designed for preservice teachers to take on two occasions—at the beginning and end of their educator preparation program experience—but concern over the cost and usefulness of the test changed this requirement to only once (Hairston, 2014).

The MEP is supposed to measure a teacher candidate’s disposition in six areas, or the so-called six drivers of teacher performance. The six areas are further divided into 16 subscales. The score report a candidate receives, namely the MEP Development Report, includes standardized scores for the six drivers of teacher performance and their corresponding subscales. The raw scores for both the six drivers of teacher performance and 16 subscales are the sum of the scores over the survey items that constitute each subscale and driver of performance. The raw score is converted to a standardized score called the sten score, which ranges from 1 to 10 with a mean of 5.5. The conversion of the raw score to the standardized sten score is based on the norm group used for the test. Even though the standardized scores are reported for each candidate, there is no passing score, nor any penalty or stakes involved if a candidate receives a very low score. The teacher candidate receiving the report is only required to share the results with their advisor and request assistance if they have trouble interpreting the results.

Because the MEP is a statewide assessment mandated for all preservice teachers seeking to enter teacher education programs in the state of Missouri, it is important that the assessment is a valid measure of teacher dispositions. In order to evaluate the validity of the assessment, we need a good understanding of the concepts associated with the assessment, and the research that has been done about the relevance of these concepts. These concepts include teacher dispositions, the six major drivers of performance for the MEP, and personality traits.

Teacher Dispositions

The inclusion of the six drivers of performance or workplace personality traits in the MEP is meant to make MEP an assessment of teacher dispositions. According to the National Council for the Accreditation of Teacher Education (NCATE, now the Council for the Accreditation of Educator Preparation or CAEP), dispositions represent “the values, commitments, and professional ethics that influence behaviors toward students, families, colleagues, and communities that affect student learning, motivation, and development as well as the educator’s own professional growth” (NCATE, 2002, p. 53). NCATE later revised its definition of teacher dispositions as “professional attitudes, values, and beliefs demonstrated through both verbal and non-verbal behaviors as educators interact with students, families, colleagues, and communities” (NCATE, n.d., Professional Dispositions section). Both versions of the definition suggest the difficulty in conceptualizing teacher dispositions and the potential for different interpretations. This has led to inconsistency and confusion for local educational agencies and teacher education

programs as they are required to design their own instruments for measuring the dispositions of teacher candidates (Dover et al., 2015; Johnston, Almerico, Henriott, & Shapiro, 2011; Koeppen & Davison-Jenkins, 2006; Newmann, 2013).

In spite of the elusive nature of the concept of dispositions, the attention paid to the construct and assessment of teacher dispositions in recent years has helped to narrow down the contents of teacher dispositions to a small number of parameters (McKenna, 2009). A widely held view is that teacher dispositions comprise habits of mind and actions concerning teaching, children, and the role of the teacher (Hammerness et al., 2005; Knopp & Smith, 2005). In this view, dispositions consist of two components, one including attitudes, beliefs, and values, whereas the other includes directly observable actions or behaviors.

Many of the accepted understandings about teacher dispositions have been developed through the study of exceptional teachers (Koeppen & Davison-Jenkins, 2006) and are believed to be tied to reflective practice (Shoffner et al., 2014). Dispositions are believed to have great value in that they help teachers respond in professionally appropriate ways and be aware of how their own cultural background may predispose their views and actions (Carroll, 2007; Thornton, 2006). There is also evidence to suggest that teacher education programs can help teacher candidates develop such dispositions, particularly when using alternative models in addition to traditional coursework (Lee & Herner-Patnode, 2010; Meidl & Baumann, 2015; Mueller & Hindin, 2011). It wasn't until recent years, however, that the issue of dispositions became more important as NCATE/CAEP began to require schools of education to provide evidence that their preservice teachers demonstrated qualities that would make them successful teachers (CAEP, 2013; Shiveley & Misco, 2010).

Major Drivers of Performance on the MEP

The MEP assesses preservice teachers in six areas called “major drivers of performance,” each with two or three subscales, out of a total of 16 subscales for the whole assessment (see Table 1). The assessment gives preservice teachers a score between 1 (low) and 10 (high) on each of the six major drivers of performance and also on each of the 16 associated subscales.

The drivers of performance and their related subscales that constitute the traits targeted by the MEP assessment are the same traits that are measured by the Workplace Personality Inventory II (WPI II), an assessment tied to the database of the US Department of Labor's Occupational Information Network (O-Net) (Mariana, 1999). The WPI II assessment was designed to measure personality traits that potentially correlate with high job performance in a wide range of fields (Pearson, 2013a). Literature on teacher dispositions suggests that the six dimensions on the MEP differed in terms of their potential relevance to teachers.

The first major driver on the MEP is *achievement*, which refers to an act or result of achieving through effort. This performance driver is valued across all occupations and not specific only to the field of teaching. The literature on the potential relevance of achievement for teachers is scant, except for the areas of teacher professional development (Colbert, Brown, Choi, & Thomas, 2008) and teacher mastery of content knowledge such as mathematics (Watson, 2001).

Table 1
Six Major Drivers of Performance and Sixteen Subscales

Drivers of Performance	Associated Subscales
Achievement	Achievement Effort Persistence Initiative
Social Influence	Leadership Orientation Social Orientation
Interpersonal	Cooperation Concern for Others
Self-Adjustment	Self-Control Stress Tolerance Adaptability/Flexibility
Conscientiousness	Dependability Attention to Detail Rule Following
Practical Intelligence	Innovation Analytical Thinking Independence

The second major driver in the MEP is social *influence*. According to Freeman (1988), teaching is a social influence process. Francis (2008) defined this as the ways by which one impacts other people’s behaviors, and summarized various ways teachers can exercise social influence in the classroom. Although this constitutes a major part of a teacher’s daily work, most of this falls into the category of strategies and skills that are outside the realm of teacher dispositions.

The third major driver of performance on the MEP, *interpersonal skills*, refers to the ability to develop meaningful relationships with co-workers, get along with people of various personal backgrounds, and interact sensitively with others’ needs and interests (Lee & Powell, 2005-2006). The literature has supported this dimension as a valuable component of teacher dispositions although they may be difficult to distinguish from other skills that embody professionalism due to their complex nature (Doo, 2006). Ferris, Witt, and Hochwarter (2001) have suggested that interpersonal skills can be developed and improved with training. For instance, teacher candidates who participated in a multicultural relationship enhancement program showed significant improvement in empathic listening and expressive speaking in situations that involved prejudice (Arizaga, Bauman, & Waldo, 2005).

The fourth driver of performance on the MEP, *conscientiousness*, is a non-cognitive skill with the potential to affect student outcomes. Cheng and Zamarro (2016) tried to validate several measures of teacher conscientiousness in their impact on student test scores and non-cognitive skills. The study found that more conscientious teachers were more effective in improving their students’ conscientiousness, although not their students’ test scores.

The fifth driver of performance on the MEP, *practical intelligence*, is the ability to find the best fit between oneself and the demands of one's environment, use acquired knowledge, and put problems in real-world contexts (Cianciolo, Matthew, & Wagner, 2005). Hedlund, Antonakis, and Sternberg (2002) made a distinction between practical intelligence from academic intelligence. Reviewing multiple studies, the authors found the development of practical skills and tacit knowledge fail to correlate positively with general or academic intelligence. The review also found little correlation between practical intelligence and personality traits.

The last driver of performance on the MEP, *self-adjustment*, refers to one's continuous efforts at adjusting one's own behaviors and adjusting for others and the environment (Calhoun & Acocella, 1990). Another term for the ability for teachers to adjust to and survive new situations is teacher resilience, a variable often mentioned in the research literature related to teacher burnout. For instance, Richards, Levesque-Bristol, Templin, and Graber (2016) studied 174 elementary and 241 secondary teachers from the Midwest of the United States to examine the potential impact of the ability of resilience on teacher role stress and burnout. The results of the study confirmed the importance of resilience in helping teachers to reduce their sense of stress and feelings of burnout. The incorporation of technology into the learning environment has also been explored as a means of self-adjustment by teachers (Baker & Baker, 2004-2005).

Personality Traits and the Six Drivers of Performance

Since the MEP is based on the WPI II, which is by its very name a personality inventory, it is important to understand how personality traits are considered and how the MEP's six drivers of performance as measured correspond to these traits. Personality refers to a person's relatively stable feelings, thoughts, and behavioral patterns (Carpenter, Bauer, & Erdogan, 2010). The most influential model that has been proposed on the construct is the Big Five personality trait model, which breaks down a person's personality traits into five dimensions: extroversion, agreeableness, conscientiousness, neuroticism (emotional stability), and openness (John, Naumann, & Soto, 2008).

There have been several studies that have examined the impact or usefulness of the Big Five for teachers (e.g. Aydin, Bavli, & Alci, 2013). For instance, Tahir and Shah (2012) found that teacher ratings in four of the five personality dimensions were positively related with their students' academic achievement (extroversion $r = 0.52$, agreeableness $r = .39$, conscientiousness $r = 0.28$, openness to experience $r = 0.09$), while neuroticism was negatively correlated ($r = -0.43$). Openness has the weakest relationship with teacher ratings and is also the dimension that does not overlap with the MEP's six drivers of performance.

A comparison of the dimensions comprising the six drivers of performance and the Big Five personality traits shows a close match in many areas. The first four dimensions of personality traits (i.e., extroversion, agreeableness, conscientiousness, neuroticism) roughly correspond with four of the six drivers of performance assessed by the MEP: social influence, interpersonal skills, conscientiousness, and self-adjustment. The only dimension of personality traits not covered by MEP is openness (see Figure 1).



Figure 1. MEP six major drivers of performance and Big Five personality traits

The developers of the MEP and WPI II presumably replaced the dimension of openness in the Big Five personality traits with achievement and practical intelligence in choosing the six drivers of performance as workplace related personality traits. Such overlapping suggests that the MEP (WPI II) is basically an instrument for assessing personality traits, even though it modifies the domain of the personality traits by eliminating the dimension of openness, while adding two dimensions: achievement and practical intelligence.

As shown previously, a small number of studies related to the MEP's six drivers of performance have documented that three personality traits—conscientiousness, interpersonal skills, and self-adjustment—are relevant to teacher success. The literature on the Big Five personality traits provides further support for the relevance of conscientiousness, interpersonal skills, and self-adjustment. This literature also suggests that the dimension of social influence or extraversion has a potential impact on the success of teacher candidates, making it another viable dimension of teacher dispositions. Overall, the studies on the relevance of the usefulness of the personality traits or drivers of performance for teachers provide some modest support for using the MEP as an assessment for teacher candidates. Nonetheless, the literature suggests that MEP may assess characteristics irrelevant for teachers as few studies have seemed to document the relevance of the following personality traits or drivers of performance for teachers: achievement, practical intelligence, openness, the first two of which are targeted by the MEP instrument.

A widely held view is that teacher dispositions comprise of both habits of mind and action. This conception of dispositions acknowledges the fact that habits of mind or thinking often underlie habits of action or behavior, an argument made by NCATE/CAEP when it proposed its revised definition about dispositions that focuses on the attitudes, beliefs, and values of teachers (NCATE, n.d.). At the same time, this conception also acknowledges that habits of mind and habits of action could each impact teacher performance separately. An educator may habitually act in a way conducive to student learning, without necessarily realizing the value or benefit of such a behavior.

Despite the different terms used, there is significant overlap among the three sets of concepts, namely, teacher dispositions, major drivers of performance, and personality traits; each focuses on habits of mind and behavior. On the other hand, important differences can also be discerned. Personality traits or drivers of performance represent personal characteristics that are relatively stable and difficult to change whereas dispositions may include aspects that are more malleable. As a result, focusing exclusively on personality traits or drivers of performance may leave out important dimensions of teacher dispositions as illustrated in Figure 2.

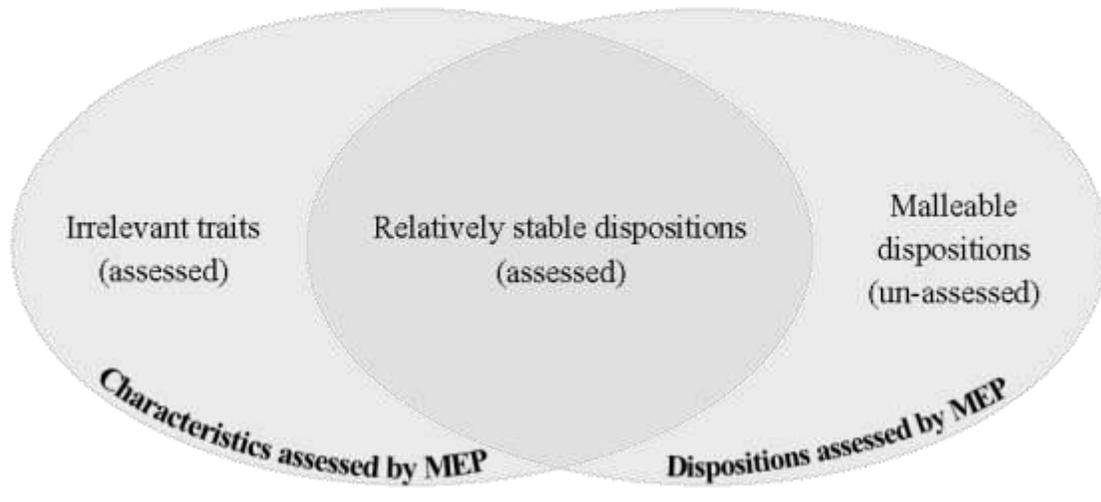


Figure 2. Characteristics of dispositions targeted and missed by the MEP

The definition of dispositions also calls for the need to pay attention to the context of the various habits of mind or behavior when we assess teacher dispositions. Teacher dispositions manifest themselves in relation to the act of teaching, the students, and the teachers themselves, all within the context of the school setting (McKenna, 2009; NCATE, n.d.). This requires us to perceive and measure teacher dispositions within the right context, since different contexts trigger different expectations for behaviors. From this perspective, the MEP as an instrument originally designed for a wide variety of workplaces may not be ideal for measuring teacher dispositions in the school setting. Such irrelevant characteristics could be those that are associated with the dimensions of achievement and practical intelligence that lacks empirical support for their relevance to the effectiveness of teachers, as mentioned earlier. The inclusion of such irrelevant aspects of personality or drivers of performance is likely to compromise the face validity and construct validity of the instrument.

Purpose of the Study

The preceding literature review suggested a potential issue with the validity of the MEP as an assessment of dispositions for teacher candidates. This study was designed to verify the suspected validity issue of the assessment with empirical evidence. The purpose of the study was twofold. First, the study used scores of preservice teachers completing the MEP to determine if the observed data supported the factor structure or relationships among the six drivers of teacher performance and the subscales. Second, the study relied on both the data and the theory about teacher dispositions in identifying and verifying a factor structure consisting of dimensions and

subscales from the assessment that was supported by the data. Specifically the study was designed to answer the following questions:

1. To what extent do the data support the hypothesized model or factor structure of the MEP assessment regarding the relationships among the six dimensions and 16 subscales of teacher dispositions?
2. What factor structure along with its corresponding dimensions and subscales of teacher dispositions may be identified and verified that fit both the observed data and the theory about teacher dispositions?

Methods

This study primarily used confirmatory factor analysis (CFA) using the Lisrel™ software package to evaluate factor structures in the data obtained for teacher candidates who recently completed the MEP test. The MEP, as a state mandated assessment of teacher dispositions, consists of 192 multiple-choice questions (Pearson, 2015). Each question relates back to one of six major drivers of performance, which are further broken down into 16 subscales.

Confirmatory Factor Analysis

A CFA was conducted as the first stage of the study to check the convergent and discriminant validity as well as the overall model fit of the factor structure about the six drivers of teacher performance and their subscales. In the CFA, the 16 subscales of the MEP construct were considered the observed variables or indicators. In contrast, the six dimensions or major drivers of performance were considered factors or latent variables. To obtain the evidence for the convergent validity of the construct, the researchers first examined the correlations between the subscale scores to see if the subscale scores belonging to the same factor (i.e., driver of performance) reached sufficiently high levels of correlation. Next, the researchers obtained standardized factor loadings which represent the correlations between each subscale and its corresponding factor. The assumption for convergent validity is that each subscale should correlate highly with its corresponding factor. Normally the standardized factor loading needs to be higher than 0.5 in order for an indicator variable (in this case each of the 16 subscales) to be retained in the model (Kline, 1998). A value of 0.5 in standardized factor loading is equivalent to 25% of the variance in the indicator variable that is explained by a factor, with 75% of the variance unexplained.

To obtain the discriminant validity evidence for the factor structure, the researchers first examined the correlations between subscales that do not belong to the same dimension or driver of performance, and then examined the correlations between the factors (i.e. the six dimensions or drivers of performance) in the study. The rationale behind the discriminant validity is that the correlations between the subscales that belong to different factors should be low (i.e., less than .50) and that the correlations between factors of educator profile should not be exceedingly high (e.g., larger than .85), since an exceedingly high correlation would suggest a redundancy of the factors (Kline, 1998).

If the factor structure of the six major drivers of educator performance and the subscales fits poorly with the data, a number of steps can be taken in the hope of identifying an alternative model with dimensions and subscales that would more accurately measure the personality traits of teachers. First, an exploratory factor analysis can be run using a random half of the sample to freely determine the number of dimensions (i.e., drivers of performance), and how the subscales load on each dimension. Next, the results of the exploratory factor analysis can be evaluated, assisted with an understanding of the expectations for teachers, to determine the number of dimensions and the subscales that need to be retained in the model. This step may result in a few competing models. At the final step, the competing models can be tested through a CFA to see if how each model fit the data. The model with the best fit, guided by theory, can be validated with the other half of the randomly split sample.

Subjects

The subjects of study were the preservice teachers from a university based teacher education program in Missouri who took the MEP test between fall 2013 and spring 2015. Altogether, there were 1215 preservice teachers from the program who took the MEP during that period. The preservice teachers came from a number of areas, including early childhood and elementary education (n = 459), middle school education (n = 146), secondary school education (n = 357), special education (n = 109), school library (n = 48), school leadership (n = 75), and counselor education (n = 21). Some of the preservice teachers were enrolled in an undergraduate program. The others were either enrolled in a graduate program for initial teacher certification, or a non-degree seeking post baccalaureate program.

The researchers obtained IRB approval from the university's Human Subject Review Committee before contacting the Office of Institutional Research for a desensitized set of the data. In the data set, no preservice teacher name, social security number, or preservice teacher ID was recorded. Instead, a temporary ID was generated for the purpose of the study. The scores provided contained the results for the six drivers of performance and the 16 subscales. Since no scores at the item level were accessible, the analyses were only based on the scores for the six factors and their subscales.

Results

The descriptive statistics of the 16 subscale scores and the six major drivers of performance are provided in Table 2. The mean of the scores for both the subscale and six dimension scores is around 6 on a scale of 1-10, with a standard deviation of around 2, suggesting that about two thirds of the teacher candidates score a value of 5 to 7 for each subscale and major driver of performance.

The relatively small value of skewness (much smaller than 1) suggests that the scores are symmetrical in distribution. The negative kurtosis values suggest that the distribution is rather flat, suggesting a relatively even distribution of the scores, with values widely spreading around the mean.

Table 2

Descriptive Statistics of Six Major Drivers of Performance and 16 Subscales (n = 1215)

Major Drivers	Subscales	Mean	SD	Skewness	Kurtosis
Achievement		5.84	2.10	.01	-.40
	Achievement Effort	5.82	2.03	.04	-.42
	Persistence	5.71	2.20	.01	-.58
	Initiative	5.86	1.97	.17	-.42
Social Influence		6.11	2.13	-.12	-.31
	Leadership Orientation	5.57	2.05	.04	-.35
	Social Orientation	6.50	2.12	-.16	-.54
Interpersonal		6.57	1.95	-.07	-.50
	Cooperation	6.39	1.98	.04	-.62
	Concern for Others	6.51	2.01	-.16	-.33
Self-Adjustment		6.50	2.05	-.17	-.42
	Self-Control	6.40	2.17	-.15	-.53
	Stress Tolerance	6.54	2.02	-.19	-.42
	Adaptability/Flexibility	5.84	2.07	.10	-.28
Conscientiousness		6.36	2.13	-.12	-.50
	Dependability	6.15	2.14	-.08	-.67
	Attention to Detail	5.94	1.92	-.11	-.18
	Rule Following	6.50	2.16	-.16	-.49
Practical Intelligence		5.47	1.85	-.13	-.11
	Innovation	5.89	1.89	-.06	-.26
	Analytical Thinking	5.58	2.09	-.05	-.24
	Independence	4.75	1.89	.02	-.30

Convergent Validity Evidence

The correlation matrix for the 16 subscale scores that are used as the indicator variables in the factor analysis can be found in Table 3. The numbers in the triangle areas represent the magnitude of correlations between subscale scores that belong to the same dimension or driver of educator performance. The correlations seem to be moderate in most cases, ranging from .14 (between analytical thinking and independence) to .72 (between persistence and initiative). In two cases the correlations are unacceptably low (i.e., .14 and .17).

Table 3
Evaluation of the Structural Model of the Six Drivers of Performance and 16 Subscales

Correlations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<u>Achievement</u>																
1. Achievement Effort																
2. Persistence	.66															
3. Initiative	.66	.72														
<u>Social Influence</u>																
4. Leadership Orientation	.37	.36	.43													
5. Social Orientation	.37	.36	.45	.52												
<u>Interpersonal</u>																
6. Cooperation	.50	.50	.51	.07	.39											
7. Concern for Others	.36	.35	.39	.00	.33	.69										
<u>Self-Adjustment</u>																
8. Self-Control	.37	.50	.41	.03	.22	.50	.37									
9. Stress Tolerance	.27	.41	.41	.36	.36	.25	.12	.49								
10. Adaptability/Flexibility	.42	.50	.63	.34	.45	.49	.37	.44	.54							
<u>Conscientiousness</u>																
11. Dependability	.65	.66	.55	.18	.27	.54	.42	.50	.27	.36						
12. Attention to Detail	.57	.56	.48	.15	.13	.35	.25	.31	.12	.26	.56					
13. Rule Following	.44	.50	.41	.07	.21	.49	.34	.47	.21	.30	.56	.41				
<u>Practical Intelligence</u>																
14. Innovation	.35	.35	.44	.26	.37	.37	.35	.23	.20	.47	.24	.23	.14			
15. Analytical Thinking	.53	.53	.55	.37	.30	.39	.25	.40	.41	.48	.46	.42	.31	.34		
16. Independence	.05	.11	.15	.24	.05	.04	-.04	.05	.21	.16	.01	-.05	-.13	.17	.14	
Model	χ^2	<i>df</i>	χ^2/df	<i>GFI</i>	<i>AGFI</i>	<i>PNFI</i>	<i>CFI</i>	<i>NFI</i>	<i>NNFI</i>	<i>IFI</i>	<i>RFI</i>	<i>RMSEA</i>	<i>RMR</i>	<i>SRMR</i>		
	1516.78	89	17.88	0.86	0.78	0.69	0.93	0.93	0.91	0.93	0.91	0.12	0.32	0.08		

Table 4 provides the estimated factor loadings using the 16 subscale scores as the indicator variables and the six determiners of performance as the latent variables or factors. The factor loading in most cases is large enough, suggesting that the construct has overall good convergent validity. However, in one case, the standardized loading between the last factor (practical intelligence) and the last indicator (independence) is very small. At least for the last factor or dimension of the construct, the relationship between the factor and its indicator is poor.

Table 4

Factor Loadings and Correlations for the Six Drivers of Performance

Major Drivers	Subscales	Factor Loadings	Correlations between the Six Major Drivers					
			1	2	3	4	5	
1. Achievement			-					
	Achievement Effort	.80						
	Persistence	.85						
	Initiative	.83						
2. Social Influence			.65	-				
	Leadership Orientation	.74						
	Social Orientation	.70						
3. Interpersonal			.62	.31	-			
	Cooperation	.97						
	Concern for Others	.71						
4. Self-Adjustment			.77	.61	.61	-		
	Self-Control	.61						
	Stress Tolerance	.64						
	Adaptability/Flexibility	.82						
5. Conscientiousness			.90	.34	.66	.58	-	
	Dependability	.83						
	Attention to Detail	.68						
	Rule Following	.64						
6. Practical Intelligence			.92	.74	.61	.91	.71	
	Innovation	.53						
	Analytical Thinking	.68						
	Independence	.18						

Discriminant Validity Evidence

The evidence of discriminant validity of the construct comes from both the correlations between subscale scores that belong to different factors or major drivers of performance, and the correlations between the factors. As shown in Table 3, the correlations between subscale scores that belong to different factors, i.e., the numbers that are outside of the triangle areas, are

sometimes around .50 or even higher. For instance, the correlation between persistence and dependability, which belong to two different drivers of performance in the MEP assessment, is as high as .66, suggesting poor evidence for discriminant validity.

In three cases, the correlation between factors (see Table 4) reaches .90 or above. The existence of exceedingly high values of covariance (e.g., larger than .85) suggests poor discriminant validity, since the model fails to explain the dimensions that are supposed to display more moderate relationships, such as that between conscientiousness and achievement.

Overall Model Fit

As shown in Table 3, the absolute fit indices (i.e., GFI, AGFI, PNFI) range from .69 to .86, and the relative fit indices (CFI, NFI, NNFI, IFI, RFI) range from .91 to .93. A good model would require such indices to reach the cutoff value of .95 or above (Hu & Bentler, 1999). As far as the residual based indices are concerned, the SRMR index is .08 and the RMSEA index is .12. A good model would require these indices to be below .06 and .08 respectively. This result suggests an overall poor fit of our data with the internal structure of the construct.

Identification of an Alternative Model

As the factor structure of the six major drivers of educator performance and the subscales fit poorly with the data, a number of steps were taken to identify an alternative model of factor structure that may more closely fit the data. First, an exploratory factor analysis using maximum likelihood extraction and oblimin rotation was run using a randomly split half of the sample. A total of 621 cases were included in the first half sample. The KMO test of sampling adequacy was found to be 0.90, suggesting that the data utilized in the study was well suited for factor analysis. The exploratory factor analysis resulted in four factors, since they were the only factors that were found to have eigenvalues greater than 1 (Kaiser, 1960). The results of the exploratory factor analysis are given in Table 5.

Table 5
Results of Exploratory Factor Analysis (KMO=0.90)

Factor	Eigenvalue	% Variance	Subscale	Rotated Factor Loadings
1	6.54	40.87	Achievement Effort	.78
			Persistence	.72
			Initiative	.54
			Dependability	.74
			Attention to Detail	.80
			Rule Following	.54
2	1.98	12.39	Leadership Orientation	.71
3	1.17	7.30	Cooperation	.72
			Concern for Others	.81
4	1.06	6.61	Self-Control	.62
			Stress Tolerance	.75

The authors selected subscales that had factor loadings near or above .50 (Kline, 1998). As shown in Table 5, there are five subscales that had relatively high loadings on the first factor, one such subscale on the second factor, and two such subscales for the third and fourth factors. Since the second factor only had one subscale with a high loading, the factor was not included in the new model. The rationale is that a factor needs more than one subscale that loads heavily on the factor to provide a reliable measure of the factor.

Next, the authors used the resulting three-factor model to run a confirmatory factor analysis. Although most of the fit indices reached acceptable levels, the key index of RMSEA suggested a poor fit. At this step, the authors examined the subscales in the model to see how each subscale may apply to the teaching profession. It was decided that among the five subscales that load heavily on the first factor, achievement effort, persistence, and initiative did not seem to be unique to teacher performance. The model is thus further simplified into a three-factor model with each factor consisting of two subscales, with dependability and attention to detail comprising the dimension of *conscientiousness*, cooperation and concern for others comprising the dimension of *interpersonal*, and self-control and stress tolerance comprising *self-adjustment*. The resulting model successfully retained three dimensions (i.e., drivers of performance) from the MEP instrument, which also corresponded to three of the five dimensions of personality traits (i.e., conscientiousness, agreeableness, and neuroticism).

The final step was to test whether the resulting model about the dimensions and subscales of teacher dispositions fit the observed data. A confirmatory factor analysis was conducted using the first half of the randomly split sample. The results are summarized in Table 6 and Table 7. Consistent with the results of the exploratory factor analysis, the relatively high factor loadings (which range from .44 to .99) suggests that each subscale retained in the model contributes significantly to its relevant factor or driver of teacher performance. In addition, all indices of goodness fit suggested that the model fit the data very well. For instance, the minimum fit function Chi-Square was 11.64, with $p = 0.071$, suggesting that the model fit well with the observed data.

Table 6
Factor Loadings and Correlations for an Alternative Model

Major Drivers	Subscales	Factor Loadings	Correlations between the Major Drivers	
			1	2
1. Conscientiousness			-	
	Dependability	.91		
	Attention to Detail	.64		
2. Interpersonal			.64	-
	Cooperation	.96		
	Concern for Others	.73		
3. Self-Adjustment			.54	.54
	Self-Control	.99		
	Stress Tolerance	.44		

Table 7
Goodness of Fit Indices for an Alternative Model

Random Sample	X^2	df	<i>GFI</i>	<i>AGFI</i>	<i>PNFI</i>	<i>CFI</i>	<i>NFI</i>	<i>NNFI</i>	<i>IFI</i>	<i>RFI</i>	<i>RMSEA</i>	<i>RMR</i>	<i>SRMR</i>
First Half	10.40	6	.99	.98	.40	1.00	.99	.99	1.00	.98	.034	.073	.018
Second Half	11.92	6	.99	.98	.40	1.00	.99	.99	1.00	.98	.040	.078	.019

Note. Table 7 contains information for the fit indices based on both the first half and second half of the randomly split sample.

To test whether the 3-factor model can be further simplified to a 2-factor model, the 3-factor model with the freely estimated factor covariance was compared with three 2-factor models where the correlations between two of the original three factors were fixed to 1. In each case, the Chi-Square difference test was found to be significant, no matter which pair of factors had their correlations constrained ($\chi^2_{\text{difference}} = 65.32, 77.32, 93.79$, respectively; $df = 1, p = 0.00$). This suggested that a nested model that had less than 3 factors would fail to provide sufficient fit with the data.

The new model was then validated through another confirmatory factor analysis using the other half of the sample. There were 594 cases in this other half of the randomly split sample. The goodness of fit indices based on the confirmation factor analysis using this sample are presented in Table 7. The analysis yielded similarly sound fit values. Since data splitting is likely to result in over confidence in parameter estimates, a cross-validation was used to examine whether the model parameters were equivalent across the two samples (Harrell, 2001). The Chi-square difference test was run to test the measurement invariance of various models, including ones that held the factor loadings, factor correlations, factor variances, and error variances invariant. The Chi-square difference test failed to reach statistical significance when the factor loadings, factor correlations, and factor variances were held constant across the two samples ($\chi^2_{\text{difference}} = 1.51, df = 8, p = 0.99$), suggesting that the measurement model was equivalent between the two groups as far as the factor loadings, factor correlations, and factor variances were concerned.

The new model that was identified and validated only contained about one third of the original dimensions and subscales of the MEP. The drastically reduced number of dimensions and subscales, as well as their corresponding items, nevertheless, makes the length of the resulting instrument more reasonable. Although it is not exactly clear how many items were associated with each subscale, on average, the reduced version of the MEP now includes approximately a total of 73 items about teacher dispositions, with approximately 12 items contributing to each of the six subscales of the instrument.

Conclusions, Discussions, and Recommendations

This study started with the factor analysis of the internal structure of a dispositions assessment mandated for teacher candidates in the state of Missouri. Based on the dimension and subscale scores of the teacher candidates in a university based teacher education program in the state, the study found limited empirical evidence to support the original hypothesized factor structure.

There are only moderate correlations between the subscale scores that belong to the same factor (i.e. driver of performance), and an unusually low factor loading (i.e. correlation) for one of the subscale scores (i.e., independence). At the same time, there were unusually high levels of correlations between some of the factors. The study also found a lack of overall fit of the observed data with the assumed factor structure of the assessment.

The second part of the study identified and verified a factor structure that consisted of three drivers of performance and six subscales (Tables 6 and 7). The revised model about the factor structure of the teacher dispositions demonstrated excellent fit with the data. The correlations and factor loadings were also at appropriate levels. More importantly, the drivers of performance that are retained in the revised model represent dispositions that have been found through our literature review and theoretical analysis to be relevant for teachers.

Discussion

The finding that the hypothesized factor structure about the dimensions and subscales of dispositions fit poorly with the observed data, an indication of a lack of construct validity for the MEP instrument, may not be hard to explain. There are several possible causes for this finding, mostly related to the poor alignment between the six drivers of performance of the instrument and the dimensions of teacher dispositions, as discussed earlier.

A closely related cause for the lack of construct validity of the hypothesized factor structure is possible low face validity. When teacher candidates were asked to take the MEP as an assessment that is supposed to indicate their potential to succeed as a teacher, they were looking for an assessment that is relevant to the teaching career. When they realized that the assessment is basically a personality profile test, and covers such traits as social influence and practical intelligence, the face validity of the MEP could be compromised in their eyes. Some test takers might feel that this was an irrelevant test, and therefore they could respond randomly.

A third factor that may have contributed to the lack of construct validity of the MEP was the social desirability bias, i.e., the tendency for test participants to fake their responses to each question on the assessment in a way that is viewed favorably by others. The fact that each person would receive a score and that the score would be scrutinized by faculty in their education program may have forced some participants to make them score well on the assessment. This tendency was recognized by Pearson for both the original WPI II and MEP (Pearson, 2013b), but it is not clear how effectively this bias has been addressed.

A final threat to the validity of the MEP as a measure of teacher dispositions comes from the scoring process. According to Pearson (2015), the norming group for the MEP was a sample of “exceptional teachers” from across the various content areas (Shuls, 2013). The group consisted of educators who had been recognized for exceptional educative ability (Hairston, 2014; Missouri State Board of Education, 2014). When an assessment instrument were normed on a relatively homogeneous sample with restricted range of abilities, the derived scores based on the unrepresentative norm group would yield either inflated or deflated scores, which would affect the estimates of reliability and validity of the instrument (Salvia, Ysseldyke, & Witmer, 2012).

Limitations

Although this study involved a large number of data cases that were likely to provide reliable results, the analyses were made only at the levels of the dimensions (i.e., drivers of performance) and subscales. Item level analysis was not performed due to a lack of access to the candidates' response to each item on the MEP instrument. As a result, the study represented a partial evaluation of the full measurement model. A complete evaluation of the construct validity of the assessment would include data at the item level as well as the subscale and the dimension levels. A complete study that includes analysis at the item level, in terms of how each item would contribute to its relevant subscale and the driver of performance, would reveal if certain items on the instrument were responsible for the lack of fit of the measurement model and what items could be revised or removed. Adjustment at the item level could lead to identification of additional useful dimensions (i.e., drivers of performance) in the factor structure. Such a study would provide additional insights on how the current instrument for assessing teacher dispositions (i.e., MEP) can be improved.

Another limitation of not having item level data is the inability for us to calculate Cronbach's alpha as a measure of internal consistency for our new second order scales. So far, to the best of our knowledge, Pearson has not released the items on the MEP to the public. In addition, we have been unable to find where the company has published a technical manual or reported Cronbach's alpha for the instrument. In order for teacher preparation programs to have a good understanding of the assessment that is required of all preservice teachers, we ask for more easily-available transparency from Pearson in sharing information about the MEP, and from all testing companies carrying out similar work on other assessments.

A third limitation is that the data were based on teacher candidates from one university and one state. Even though the makeup of the subjects of study parallels those typically found in teacher education programs, there is no guarantee that the findings can generalize beyond the specific institution or state. Future research needs to replicate this study with samples from other institutions, including those from other states. Results from such additional studies will verify what personality traits are most relevant to teaching professionals.

Recommendations

Besides the determination that the original model or factor structure did not fit the observed data, this study was able to identify and verify a factor structure (see Tables 6 and 7) that was not only supported by the data, but also by theory. Although this new model was still based on data that had a number of validity threats, the threats are dependent on the specific items, subscales, and dimensions. The fact that the newly identified model consists of dimensions of dispositions relevant to teachers, as shown earlier, makes the model that consists of those select dimensions less susceptible to the validity issues.

The new factor structure thus identified may be utilized by teacher education programs that are participants in the MEP to a productive end. For instance, advisers of teacher candidates who recently completed the assessment could suggest to the candidates to focus mostly on the three drivers of performance (interpersonal skills, conscientiousness, and self-adjustment), and the two

subscales for each driver of performance, since only these scores seem to be reliably obtained and have relevance to teacher dispositions. Information from this factor model may also guide teacher education programs to prioritize their curriculum and instruction to come up with course work and field experiences that may help teacher candidates strengthen their dispositions in those areas. Gunn, Peterson, and Welsh (2015), for instance, suggested designing courses for preservice teachers teaching cases that combine course content with diversity issues. Unlike traditional theory driven courses, teaching cases courses utilize a methodology that connects practical, field-based scenarios that promotes culturally responsive dispositions. Meidl and Baumann (2015), in their turn, talked about the need for preservice teachers to engage in community services that may not be tied directly to classroom activities. Participation in such community services may encourage them to reflect on why they decide to teach, and help them to be committed to their students.

The usefulness of the newly identified factor structure also goes beyond institutions that currently participate in the MEP assessment. The factor structure represents empirical justification for including the following three dimensions in measuring teacher dispositions: *interpersonal skills*, *conscientiousness*, and *self-adjustment*. It is suggested that all teacher education programs target those dimensions in their assessment of teacher dispositions.

It is important to realize, though, that the dispositions targeted by the MEP, whether in the original hypothesized model, or the revised model, only focus on the personality traits. A more complete assessment of teacher dispositions should contain dispositions beyond personality traits of teacher candidates: namely, habits of mind or thought that are prone to change as a result of their experience during teacher education. For example, NCATE/CAEP expects all teacher education programs to include in their assessment of candidate dispositions: fairness and belief that all children can learn (NCATE, 2008). Those dispositions seem to be relatively easy to cultivate and develop by the teacher candidates, but don't seem to be directly assessed by the MEP.

It is also important to realize that the three dimensions of dispositions in the newly derived factor structure: *interpersonal skills*, *conscientiousness*, and *self-adjustment*, are not so easy to cultivate or develop in teacher candidates. The fact that the identified factor structure has specified and narrowed down the subscales for each dimension, nevertheless, may make the cultivation of such dispositions more manageable, as the subscales point to the specific aspects of personality traits in those dimensions. For instance, the newly identified factor structure removed the subscale of rule-following and retained dependability and attention to detail as subscales for the dimension of conscientiousness. Focus on relatively fewer subscales may help teacher education programs more effectively promote the dispositions that may not be so easy to change. Another strategy that teacher education programs can adopt to make the dispositions more malleable for teacher candidates is to contextualize the dispositions. For instance, it may be difficult to change a teacher candidate's dependability in a general sense. Nevertheless, if we target dependability in the context of the school setting, and consider aspects of dependability that really matters for teachers, such as being punctual with each lesson, grading and treating students in a way consistent with stated class policies, the task of fostering the candidates' dispositions may be more manageable.

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