Association of Pre-Service Teachers' Performance, Personality, and Beliefs with Teacher Self-Efficacy at Program Completion

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Introduction

With teacher turnover costing the U.S. as much as $7 billion per year (National Commission on Teaching and America's Future, 2007), and the continuing demand for qualified teachers, it is imperative for schools to increase retention rates among their faculty (Ingersoll & Smith, 2003). Retention efforts are especially important among novice teachers, those who are in the first five years of their teaching career, because they leave the profession at higher rates than their more experienced counterparts (Keigher, 2010; Ingersoll, 2003). In the more challenging early years of teaching, novice teachers with a higher sense of teacher self-efficacy are more likely to persist and stay in the profession (Knobloch & Whittington, 2002). This suggests the importance of self-efficacy as a target for growth during teacher preparation, but little is known about how teacher self-efficacy develops in those who

are just starting their careers. Traditionally, self-efficacy has been conceived not as a stable trait, but as a situationally bound construct based on information which is being drawn from a particular context (Bandura, 1986). Among new teachers who have spent little time in the classroom, self-efficacy is likely driven by a combination of factors, including experiences and skills in the classroom, knowledge of content and pedagogy, attitudes, and personal dispositions (Bandura, 1997; Gist & Mitchell, 1992; Woolfolk & Hoy, 1990). This study will address the gap which exists in our current understanding of pre-service teachers' self-efficacy development by examining the joint contribution of pre-service teachers' observed performance during student teaching, and more stable personal features of their personality and beliefs about how children learn, to their teacher self-efficacy upon completion of a teacher preparation program.

Teacher Self-Efficacy—Definition and Developmental Mechanism

Teacher self-efficacy is defined as a teacher's belief in his or her ability to complete the steps required to accomplish a particular teaching task in a given context (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). From this definition, it must be noted that self-efficacy is not an actual measure of competence, but a sense of confidence in, or future-oriented perception of, the competence one might expect to display given a certain set of circumstances (Hoy & Spero, 2005). Teacher self-efficacy is conceptualized as a unified higher order construct encompassing the more specific domains of self-efficacy of instructional strategies, self-efficacy of classroom management, and self-efficacy of student engagement (Tschannen-Moran & Woolfolk Hoy, 2001). Bandura (1993) suggests that people with a low sense of efficacy in a given situation fall easy victims to stress and depression because they take difficult tasks and their perceived inability to deal with them personally. People with high self-efficacy treat difficult tasks as an opportunity for mastery, attributing failure to a lack of effort or skills, both of which are in their hands to correct (Bandura, 1993). This sense of control allows them to quickly recover their feelings of self-efficacy after a setback. Keeping this model in mind, we can establish the importance of equipping pre-service teachers with a high sense of efficacy, so that they may persist through the challenges of the induction year.

Since the construct of self-efficacy was introduced, compelling evidence has emerged linking teacher self-efficacy to numerous important teacher outcomes. Greater self-efficacy has been associated with teachers' expressed professional commitment for both pre-service teachers (Evans & Tribble, 1986) and in-service teachers (Coladarci, 1992), with teachers who have higher self-efficacy saying they would once again choose teaching as a career if given the choice. Teachers with high self-efficacy are also more likely to stay in teaching once they have entered the field (Burley, Hall, Villeme, & Brockmeier, 1991), and teachers who leave the teaching field have been found to have significantly lower teacher self-efficacy than even those in their first year of teaching (Glickman & Tamashiro, 1982).

High teacher self-efficacy has been linked to especially positive outcomes for novice teachers (Burley et al., 1991; Hall, Burley, Villeme, & Brockmeier, 1992). Teachers reporting a strong sense of efficacy upon completing their first year of teaching have greater job satisfaction and a more positive attitude towards the teaching profession. They also experience less stress and find the support they receive in their first year of teaching to be adequate. Most importantly, teachers with a higher sense of teacher self-efficacy after their first year have greater optimism than other novice teachers that they will remain in the field of teaching. It must be noted that these results display correlations between factors, and not causal relationships, so it is difficult to say if adequate preparation leads to fewer difficulties in teaching, which leads to higher self-efficacy, or if more positive dispositions lead to more positive interpretations of classroom experiences, which leads teachers to feel that they have been adequately prepared (Hoy & Spero, 2005). On the other hand, consistent links between teacher self-efficacy and teacher persistence and resilience (Yost, 2006) do suggest that teacher self-efficacy might play an important role in the process of teacher retention and should therefore be explicitly facilitated during teachers' pre-service years.

Contributors to Teacher Self-Efficacy

Bandura (1993) postulated four sources of information which contribute to the formation of self-efficacy beliefs, including mastery experiences, verbal feedback, vicarious experiences, and physiological and emotional arousal as a result of an experience. According to Bandura, mastery experiences are the strongest source of information that contributes to self-efficacy beliefs, because they allow one to connect actual experiences to possible future outcomes. If one believes that one has completed a task successfully, self-efficacy is increased, and a precedent is established from which future expectations of success can be drawn. On the other hand, a perception of not achieving mastery on a task can lead to lowered self-efficacy and future expectations of failure. Based on these findings, our model for pre-service teacher self-efficacy hypothesizes that high quality teaching during student teaching will serve as a mastery experience, resulting in higher self-efficacy for those who experience success.

Several recent papers have also examined the influence of context, posited to be a combination of personal factors of teachers and features of the classroom, on teachers' self-efficacy beliefs (Guo, Justice, Sawyer, & Tompkins, 2011; Tschannen-Moran & Johnson, 2011) and found significant relationships. The difficulty in translating these findings to the self-efficacy beliefs of pre-service teachers is that they do not yet have many teaching experiences from which to draw information, or a classroom environment in which to situate their future expectations. Researchers have suggested that novice teachers who have not spent time in the classroom may depend more on other inputs to form their expectations of future success (Tschannen-Moran & Johnson, 2011; Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998), yet there is little clarity on what those inputs might be.

The current study aims to address this gap in the literature by drawing on Rimm-Kaufman and Hamre's (in press) recently proposed Comprehensive Model of Teacher Quality which highlights the importance of studying teachers as developing human beings and considering the importance of their underlying psychological attributes (e.g., personality, emotions, attitudes, cognitive ability, beliefs) in explaining variations between teachers. Even though a host of psychological attributes could potentially be associated with pre-service teacher self-efficacy, for the purposes of this study we have chosen to focus specifically on two foundational attributes which underlie the decisions that teachers make in the classroom and how the events of their classroom are interpreted: teachers' personality and their beliefs about children's development and learning.

Personality and Self-Efficacy

The literature contains consistent evidence that personality characteristics predispose individuals to view the events of their life in particular ways (Kaplan, 1996), and without a large array of concrete classroom experiences on which to base future expectations, this predisposition could play a much greater role in the self-efficacy of pre-service teachers than in that of more experienced teachers. The five-factor model of personality (Costa & McCrae, 1992a) is one of the most well-researched models of personality. This model posits that the personality of adults can be most completely described in terms of five factors: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Of the factors which comprise the five-factor model of personality, two in particular may be important in self-efficacy research because of their association with affective tendencies that Bandura (2008) highlights in his recent work. The neuroticism domain is considered a measure of one's disposition towards psychological distress, whereas extraversion is thought to capture a broad range of positive traits such as activity, sociability, and the tendency towards pleasure and joy (Costa & McCrae, 1992b).

The personality literature shows a consistent and robust relationship between neuroticism and negative affect and extraversion and positive affect (Costa & McCrae, 1980; Meyer & Shack, 1989; Suh, Diener, & Fujita, 1996; Watson & Clark, 1992), and since Bandura's recent work suggests that self-efficacy can be enhanced by positive affect and reduced by negative affect (Bandura, 2008), neuroticism and extraversion might be important explanatory variables in a model of pre-service teacher self-efficacy. The predictive value of extraversion on career outcomes has also been investigated in teaching populations, with high levels of extraversion among pre-service teachers (Ripski, LoCasale-Crouch, & Decker, 2011) and in-service teachers (Henson & Chambers, 2002) predicting higher teacher self-efficacy. Based on these findings we hypothesize that extraversion will be positively related to pre-service teacher self-efficacy, and neuroticism, which is usually inversely correlated with extraversion (e.g., Eysenck, Pearson, Easting, & Allsop, 1985; Francis, Philipchalk, & Brown, 1991), will be negatively associated with pre-service teacher self-efficacy.

Self-Efficacy and Teacher Beliefs

Similar to personality, teachers' beliefs about children and how they learn are fundamental to their teaching practice (Pianta et al., 2005). In much the same way as personality, teachers' beliefs about children serve as a lens through which the events of a classroom are interpreted, eventually contributing to or detracting from the pre-service teachers' sense of self–efficacy. Higher teacher self-efficacy is associated with more child-centered or constructivist learning environments (Weber & Omotani, 1994), and teachers with higher teacher self-efficacy are less likely to support the use of controlling or custodial discipline practices (Woolfolk, Rosoff, & Hoy, 1990). Teachers with more progressive, child-centered beliefs about student learning tend to share more positive emotional experiences with their students than teachers with more traditional, adult-centered views (Driscoll & Pianta, 2010), and students in their classrooms tend to display a greater motivation to learn (Stipek, Feiler, Daniels, & Milburn, 1995), lower anxiety (Hart et al., 1998), and higher competence in language and problem-solving (Stipek et al., 1998) than their peers in more authoritative classroom settings.

Because the association between teacher self-efficacy and student performance is posited to be bidirectional (Ross, 1998), it is possible that when teachers with more democratic or developmentally-oriented beliefs provide higher quality learning opportunities in their classrooms (Pianta et al., 2005), they elicit more positive affect and higher achievement from their students, which makes the teachers in turn feel more efficacious. It is also possible that because teachers with more child-centered views see children as partners in the creation of knowledge, they are less likely to consider children's difficulties in the classroom as their own personal failures. Though the exact mechanism is not yet clear, prior research has shown a consistent relationship between teachers' beliefs about children and their self-efficacy (Woolfolk & Hoy, 1990), suggesting the importance of including these beliefs in a model of pre-service teacher self-efficacy. We hypothesize that in such a model, more traditional, adult-directed beliefs will be negatively associated with teacher self-efficacy.

Summary and Study Aims

Research has consistently shown the negative impact of high teacher attrition rates among early career teachers (Ingersoll, 2003; NCTAF, 2007), and previous studies have established teacher self-efficacy as an important correlate to teachers' resilience and persistence in the field (Yost, 2006). However, to our knowledge very little research has examined the factors related to the self-efficacy beliefs of teachers in the developmentally unique period when they are transitioning from teacher preparation to professional teaching. The current study aims to address this critical gap in the literature by testing a predictive model which considers the joint contribution of mastery teaching experiences and teachers' underlying psychological attributes of personality and beliefs to pre-service teacher self-efficacy. Our work was guided by a specific research question: to what degree are pre-service

teachers' observed student teaching, personality, and beliefs about how children learn associated with their level of teacher self-efficacy upon completion of their teacher preparation experience?

Method

This study uses data that are drawn from a larger, ongoing data collection effort made by a school of education to conduct prospective studies of teacher education and professional development. In the institution in which this work took place, all students in the teacher education program have been asked to complete surveys upon program entry and exit since fall 2006 to support the development of a participant pool that allows systematic data to be gathered on pre-service teachers. Data from observations made by university supervisors during student teaching are also included in the participant pool.

Participants

Participants were 509 pre-service teachers drawn from four cohorts of final year teacher education students at a state university. The final sample was 82% female, and had an average age of 24.1 years. A majority of participants described themselves as Caucasian (86.2%), with 5.4% describing themselves as African-American/Black, 4.3% as Asian, and 2.3% as Hispanic. Of the pre-service teachers in the sample, 45.3% were preparing to teach elementary students, and 54.7% were preparing to teach secondary students. The participants were enrolled in one of two degree programs. Sixty-eight percent were enrolled in a five-year combined Bachelor/Master of Teaching program, and thirty-two percent were enrolled in a two-year Master of Teaching program designed for those who already have an undergraduate degree and wish to pursue a career in teaching.

Setting

All participants in the sample were in the final year of a teacher preparation program and had completed education classes focused on general and content-specific teaching and assessment techniques, and classroom management. Both programs of study gave pre-service teachers opportunities to observe teachers in nearby schools, and all participants completed a semester-long student teaching field experience in the fall of their final year, in which they played an active instructional role in the classroom of one or more professional teachers.

Data were collected at two time-points for each cohort of pre-service teachers: (1) during the student teaching placement, when pre-service teachers were observed by university supervisors using the Classroom Assessment Scoring System (CLASS; Pianta, LaParo, Hamre, 2008; Pianta, Hamre, Hayes, Mintz, & LaParo, 2008), and (2) in the last semester of teacher preparation, when pre-service teachers completed exit surveys. Exit surveys included a short demographic questionnaire, and three

other scales: the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992a), the Modernity Scale (Schaefer & Edgerton, 1985), and the Teacher Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001).

Measures

Demographic information. A demographic questionnaire assessed characteristics including, gender, ethnicity, degree program (undergraduate vs. graduate), and level (elementary vs. secondary) of student teaching placement.

Personality. The *neuroticism* and extraversion subscales of the Neo Five-Factor Inventory (NEO-FFI) were the measures used to assess personality for this project (Costa & McCrae, 1992a). Participants responded on a 5-point scale ranging from 1-*strongly disagree* to 5-*strongly agree*. Some items were reverse coded so that a higher score suggested a greater tendency towards the personality factor measured in the subscale. Items from the different subscales included, "I often feel inferior to others," (neuroticism), and "I really enjoy talking to people," (extraversion). Cronbach's alphas for the two NEO-FFI dimensions in this sample were .77 (neuroticism) and .81 (extraversion). Means and standard deviations are reported in Table 1.

Beliefs about children. Teachers' beliefs about children and how they learn were measured using the Modernity Scale (Schaefer & Edgerton, 1985), a 16-item scale which differentiates between more traditional or adult-directed views and those ideas about children which are more progressive or child-centered. Participants responded on a 5-point scale ranging from 1-*strongly disagree* to 5-*strongly agree*, with lower

Table 1
Zero Order Correlations and Descriptive Statistics (N = 509)

Variable	M (SD)	1	2	3	4	5	6	7	8	9
1. Emotional support	5.52 (.59)	-	.65	.54	.03	-.09	-.09	-.05	.02	.01
2. Classroom organization	5.06 (.86)		-	.48	.01	.02	-.21	-.11	-.02	-.02
3. Instructional support	4.26 (.94)			-	.02	-.04	-.20	-.01	.08	.08
4. Extraversion	3.70 (.50)				-	-.42	-.09	.33	.29	.31
5. Neuroticism	2.54 (.64)					-	-.01	-.23	-.27	-.25
6. Beliefs about children	2.32 (.48)						-	-.22	-.17	-.18
7. TSE student engagement	7.34 (.96)							-	.77	.80
8. TSE instructional strategies	7.45 (.92)								-	.80
9. TSE classroom management	7.36 (.97)									-

Note. TSE = Teacher Self Efficacy.

responses indicating more child-centered views, and higher responses indicating more adult-directed views. Scores for this scale were calculated using the mean of all the items, with the items capturing child-centered views reverse-coded. Sample items from the scale ranged from, "Children must be carefully trained early in life or their natural impulses make them unmanageable," (adult-directed), to "Children should be allowed to disagree with their parents if they feel their own ideas are better," (child-centered). Cronbach's alpha for this scale in the present sample is .74. Means and standard deviations are reported in Table 1.

Teacher self-efficacy. Participants in the study completed the Teacher Sense of Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001) which captures respondents' perceived level of control or influence over various aspects of the teaching and classroom environment. The scale consists of 24 items, comprising 3 composite subscales: *efficacy for instructional strategies*, *efficacy for classroom management*, and *efficacy for student engagement*. Sample items include, "How much can you do to control disruptive behavior in the classroom," as well as "How much can you do to motivate students who show low interest in schoolwork." Items were rated by participants based on a 9-point scale with the following anchors: 1-*nothing*, 3-*very little*, 5-*some influence*, 7-*quite a bit*, and 9-*a great deal*. The scale has been previously validated for use in pre-service, with the authors suggesting that for this particular population the three-factor structure is less distinct, and the use of an overall score for teacher self-efficacy may be more appropriate than the subscale scores (Tschannen-Moran & Woolfolk Hoy, 2001). Cronbach's alpha for the subscales ranged from .90 to .93.

Mastery teaching performance. The Classroom Assessment Scoring System (CLASS) was the measure used to assess the quality of the of participants' observed teaching practice (CLASS; Pianta, LaParo, Hamre, 2008; Pianta, Hamre, Hayes, Mintz, & LaParo, 2008). The CLASS has both elementary and secondary versions. Both versions rate the quality of classroom interactions that fall into three broad domains: *Emotional Support* (including the dimensions of positive climate, negative climate, teacher sensitivity, regard for student perspectives), *Classroom Organization* (including the dimensions of behavior management, productivity, instructional learning formats), and *Instructional Support* (including the dimensions of concept development, quality of feedback, and language modeling for the elementary version, and procedures & skills, content understanding, analysis & problem solving, and quality of feedback for the secondary version). In both versions, each dimension is scored on a 7-point scale, with 1-2 representing low scores, 3-5 representing moderate scores, and 6-7 representing high scores. High classroom quality is indicated by obtaining high scores in all of the dimensions, except negative climate, in which a low score is desirable. Domain-level alphas for the study sample ranged from .62 to .83.

University supervisors observed all pre-service teachers in the study sample
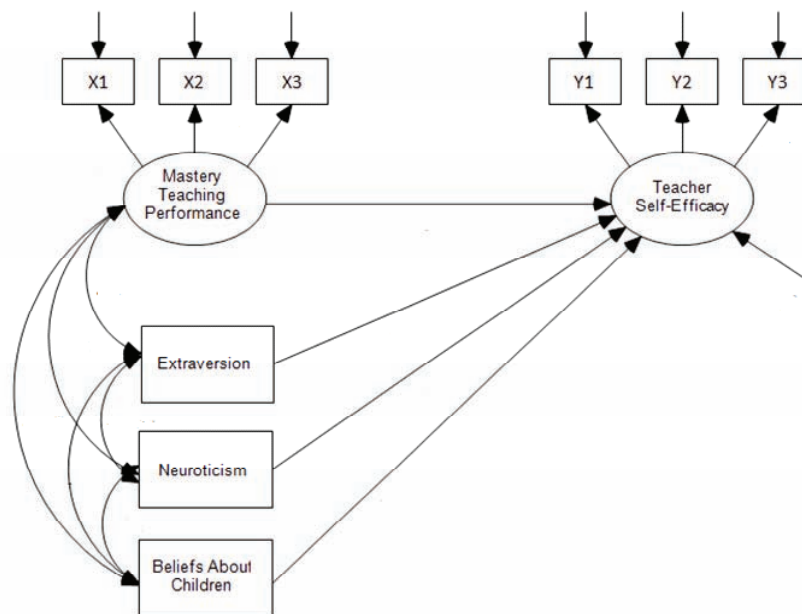
with the CLASS near the end of their students teaching field placement, in the fall semester of their final year in the teacher preparation program. Prior to these observations, all university supervisors attended a two-day training during which they watched sample teaching videos, practiced coding with the CLASS, and discussed the video segments. Before being cleared to conduct observations, university supervisors had to achieve coder reliability of at least 80% within one scale point of "master coded" responses. The master codes were established for this reliability test by a group of coders who had extensive knowledge and experience with CLASS coding. Once university supervisors were able to code reliably, they observed each pre-service teacher for two 20-minute cycles, with each followed by a 10-minute period for recording codes. Scores for the two cycles were averaged together to obtain the domain-level scores used in this study.

Data Analysis

We tested our hypotheses (see Figure 1 for theoretical model) using structural equation modeling (SEM) in the AMOS 17.0 statistical program. SEM is a methodology which tests a hypothesized model of relationships between a set of variables, to

Figure 1.
Theoretical model of relations between the study variables.

Note: Latent constructs are shown in ellipses, and observed variables are shown in rectangles. X1=Emotional Support; X2=Classroom Organization; X3=Instructional Support; Y1=Self-efficacy for Student Engagement; Y2=Self-efficacy for Classroom Management; Y3=Self-efficacy for Instructional Strategies.

determine the extent to which the current data are consistent with it (Byrne, 2001). SEM is a confirmatory approach in which the goal is to accept rather than reject the null hypothesis. The consistency between the data and the theoretical model in this method is referred to as the goodness of fit, and can be assessed using an array of fit indices and the chi-square test statistic (Loehlin, 2004). If the model fits the data well, this serves as support for the existence of the hypothesized relationships between variables. Another advantage of using SEM is that it allows for the use of two or more observed variables (e.g., items or subscales) as indicators of an unobserved or underlying construct which is called a latent variable. Also, considering consistent findings in the research and measurement literature that measurement error can reduce the relationships between variables (e.g., Fan, 2003; Gulliksen, 1987), the ability to model measurement error in our analyses was an important consideration in selecting an SEM framework for our analytic approach.

Three aspects of teacher self-efficacy were measured, namely—self-efficacy for student engagement, classroom management, and instructional strategies. Rather than creating a separate model per outcome, predictors were modeled on the latent construct of "teacher self-efficacy," based on the recommendation of the scale's author that especially for pre-service teachers, the items included in these three subscales loaded onto a higher order factor which represented a single construct of teacher self-efficacy (Tschannen-Moran & Woolfolk Hoy, 2001). In this model, we also used the three subscales of our observed teaching measure—classroom emotional support, organization, and instructional support—to create a latent variable of mastery teaching performance. This decision was supported by consistent literature suggesting that these subscales are significantly related to each other and represent a unified construct of effective teaching (Hamre & Pianta, 2007; Pianta & Hamre, 2009). Intercorrelations between the indicators of the latent variables in this model are presented in Table 1.

The covariates initially tested included teacher gender, ethnicity, degree program, and grade level of student teaching placement. In the initial analysis, none of these covariates were significantly related to the outcome measure (i.e., teacher self-efficacy), and the direction and magnitude of the model estimates were not different from those which resulted when the covariates were not in the model. Therefore, for the sake of model parsimony, the covariates were not included in the final model.

Results

A SEM model was used to empirically test the extent to which mastery teaching performance during student teaching, personality characteristics (extraversion and neuroticism), and teachers' beliefs about how children learn predicted pre-service teacher self-efficacy at the completion of a teacher preparation program. The probability of testing for close fit was statistically non-significant ($p = 0.97$), providing evidence that the model should not be rejected. A range of model fit

indices, described here, were used to assess the extent to which the data fit the theoretical model. The root-mean-square error of approximation (RMSEA) is an adjusted χ^2 which takes into account the degrees of freedom in the model. For a well-specified model, RMSEA values of .06 or less are an established benchmark reflecting good fit (Hu & Bentler, 1999). The Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the normed Tucker-Lewis Index (NFI) were also used to examine model fit. These indices show the extent to which the model fits the data better than a model which assumes no association among variables, but the CFI imposes a penalty for the number of parameters being estimated. Values greater than .90 are typically considered adequate for the CFI, TLI, and NFI fit indices, but values above .95 are preferable, and generally considered to be indicators of good fit (Bollen, 1989; Bryne, 2001; Hu & Bentler, 1999). Model fit statistics for the current model are presented in Table 2. Taken as a whole, these statistics indicate that our hypothesized model fits the data well. Also, the factor loadings for the observed measures of mastery teaching performance (classroom emotional support, organization, and instructional support) and the observed measures of teacher self-efficacy (teacher self-efficacy of student engagement, instructional strategies, and classroom management) suggested that these measures were statistically sound indicators for the latent variables in the model.

Overall, the model accounted for 18% of the variance in pre-service teachers' self-efficacy at the end of teacher preparation ($R^2 = 0.18$), suggesting that the model predicts pre-service teacher self-efficacy moderately well. In accordance with our expectations, pre-service teachers' levels of extraversion and neuroticism were both significant predictors of their levels of teacher self-efficacy at the end of their teacher preparation experience. Extraversion was positively associated with self-efficacy, meaning that pre-service teachers who had a higher propensity towards
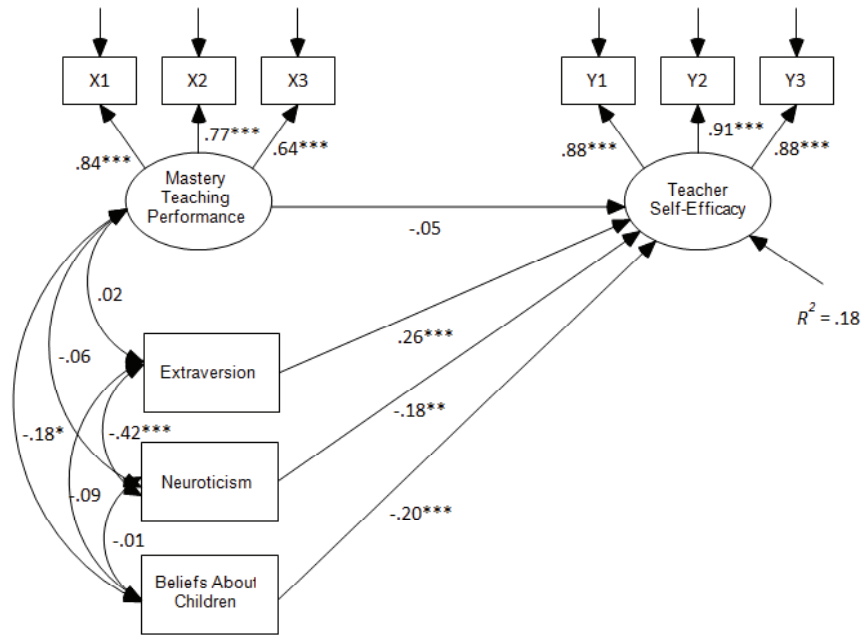
Table 2.
SEM Model (Figure 2) Fit Assessment.

Model fit indices	Model with mastery teaching performance, personality, and beliefs ($N = 509$)
χ^2	25.42 ($p = 0.19$)
df	20
RMSEA	0.02 $CI^{90} = (0.00, 0.05)$ p (for close fit) $= 0.97$
CFI	0.99
TLI	0.99
NFI	0.98

Note. Fit indicates the extent to which model reproduced data. RMSEA = Root-mean-square error of approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; NFI = Normed Fit Index.

positive affect and were more outgoing and sociable also felt more confident they would be successful as professional teachers. On the other hand, neuroticism was negatively associated with self-efficacy, meaning that pre-service teachers who were more prone to negative affect, anxiety, and psychological distress in general, also felt less prepared to face the challenges of the classroom once they entered the field. Finally, teachers' beliefs about children's development and how they learn were negatively associated with teacher self-efficacy. This means that pre-service teachers who held more progressive, democratic beliefs about how children learn were more confident about their ability to succeed in the classroom.

Contrary to expectations, teachers' mastery teaching performance was not a significant predictor of teacher self-efficacy at the end of teacher preparation. Even though, as noted earlier, the indicators of mastery teaching performance loaded strongly onto our latent variable, the results suggest that how teachers performed in the classroom during student teaching was not related to how confident they felt about

Figure 2.
Structural model of relations between pre-service teachers' mastery teaching perfor-mance, extraversion, neuroticism, beliefs about children, and teacher self-efficacy.

Note: Latent constructs are shown in ellipses, and observed variables are shown in rectangles. X1=Emotional Support; X2=Classroom Organization; X3=Instructional Support; Y1=Self-efficacy for Student Engagement; Y2=Self-efficacy for Classroom Management; Y3=Self-efficacy for Instructional Strategies. Standardized regression weights reported. * p < .05. ** p < .01. *** p *< .001.*

the quality of their future performance as teaching professionals. Figure 2 shows the complete structural model with standardized coefficients and significance levels.

Discussion

The present study investigated the association between pre-service teachers' observed mastery teaching performance, personality traits, beliefs about children, and teacher self-efficacy upon completion of a teacher preparation program. The study had four important findings. First, pre-service teachers who were more outgoing had a higher sense of teacher self-efficacy at the end of the teacher preparation program. Second, pre-service teachers who had a greater tendency towards negative affect and anxiety felt less confident about their future success as teachers. Third, pre-service teachers who had more constructivist, democratic beliefs about how children learn felt more efficacious at the end of their pre-service experience. Finally, pre-service teachers' observed mastery teaching performance during student teaching was unrelated to their levels of teacher self-efficacy at program completion. Taken together, these findings provide initial evidence that for pre-service teachers, who have spent limited amounts of time in the classroom context, relatively stable psychological attributes such as personality traits and beliefs may serve as important predictors of teacher self-efficacy even when accounting for mastery teaching experiences.

In examining the contribution of personality to teacher self-efficacy upon program completion, results showed that pre-service teachers who were more social and outgoing, and less anxious, reported higher levels of self-efficacy in this sample. These results align with previous findings that individuals with higher levels of extraversion exhibit higher levels of career self-efficacy and job satisfaction (Connolly & Viswesvaran, 2000; Rottinghaus, Lindley, Green, & Borgen, 2002; Van den berg & Feij, 2003). Teaching is a very stressful profession (Kyriacou, 1998), requiring high levels of social interaction (Sikula, Buttery, Guyton, 1996), and extraverted individuals who are naturally prone to positive affectivity and enjoy interacting with others (Costa & McCrae, 1992b) might feel better prepared to enter such a career. Similarly, teachers who are less prone to psychological distress tend to be less reactive and can better manage the stresses of teaching (Innes & Kitto, 1989), so they may also feel more confident that they will be able to succeed in such a stressful work environment. In addition, the positive physiological and emotional arousal associated with high extraversion and low neuroticism is another source of self-efficacy (Bandura, 1993), further clarifying why teachers in this sample who exhibited these personality traits might have reported higher levels of teacher self-efficacy.

Pre-service teachers in this sample who reported more developmentally-oriented beliefs also reported higher teacher self-efficacy. There are two possible interpretations of this finding. The first is grounded in research indicating that teachers with a developmental orientation create learning experiences that support

students' academic and social competence (Comer, Haynes, Joyner, & Ben-Avie, 1996), because they understand patterns and variations in human development, and can draw upon this knowledge when designing instruction (Snyder & Lit, 2010). Since pre-service teachers learn about the importance of a developmental orientation for student success as part of the teacher preparation process, teachers whose own beliefs align well with this approach may feel that they are likely to succeed in supporting their students' social and academic growth, resulting in increased self-efficacy in much the same way that a vicarious experience might. A second interpretation might be that developmentally-oriented beliefs reflect an understanding that learning is at the very least a transactional process (Moll & Whitmore, 1993) to which children contribute greatly. Perhaps teachers with this orientation are less likely to interpret their students' struggles in learning as their own personal failure, yet they acknowledge that teachers play an important role in facilitating learning. More research is needed to further clarify the relationship between teachers' beliefs and their sense of self-efficacy, including research which examines the role of other belief systems (e.g., teacher beliefs about relationships and attachment styles) in the development of teacher self-efficacy.

An interesting finding in our study was that individual differences in pre-service teacher disposition and beliefs were important predictors of the confidence they held in their abilities to succeed in their new career even when accounting for mastery teaching experiences. Our particular measure of mastery teaching was not significantly associated with teacher self-efficacy, despite prior work on teacher self-efficacy suggesting that mastery experiences provide the most influential information in self-efficacy development (Bandura, 1997). This may be due to the fact that we used an actual measure of mastery based on independent, objective observation conducted by university supervisors, whereas past work has focused more on teachers' perceptions of mastery in the classroom. There are often discrepancies between observed and self-reported measures of performance (Burstein et al., 1995; Mayer, 1999; Smithson & Porter, 1994) that could exist for multiple reasons. For example, we know little about how supervisors interpreted the observational data for pre-service teachers, or what standard pre-service teachers may set for themselves when self-evaluating their teaching. Alternatively, these findings may hint that the structure and formation of teacher self-efficacy beliefs is different in pre-service populations since they have not spent as much time in the classroom (Tschannen-Moran & Woolfolk Hoy, 2001; 2007), relying much more heavily on pre-existing characteristics of the teachers than actual teaching experiences. Further research which includes both observed and self-reported measures of mastery are needed to clarify this aspect of pre-service teacher self-efficacy development.

Educational Implications

Three educational implications may be drawn from this study. The first stems from our finding that pre-service teachers who hold more developmentally oriented

beliefs have a higher sense of self-efficacy at the end of their preparation experience. One way institutions of teacher education may possibly support a more developmentally oriented approach to teaching among pre-service teachers is to integrate a greater emphasis on child and adolescent development in their programs of study (Darling-Hammond, 2006; Snyder & Lit, 2010). But, to fully capitalize on teacher's developmentally oriented beliefs as a vehicle for affecting teacher self-efficacy, further research is needed into how these beliefs develop, how they are related to other teacher attributes such as knowledge about development, and the exact mechanism by which developmentally oriented beliefs impact teacher self-efficacy.

The second implication from this study involves individual differences in teacher personality. Teacher preparation programs educate individuals from a range of backgrounds, with varying education, maturity, and past experiences. Research tells us that teaching practice is impacted by personal experiences that teachers have in their lives (Clandinin & Connelly, 1995) and the thought processes that underlie their behaviors (Clark & Peterson, 1986), and that personality traits may influence both of these areas (Costa & McCrae, 1992b; Kaplan 1996). For this reason, helping pre-service teachers explore and understand their own personality may help them feel better prepared at the start of their teaching careers. As suggested by Rimm-Kaufman and Hamre (2010), even though it may not be possible to change stable elements of basic personality traits, programs might play a role in helping pre-service teachers modify the characteristic adaptations, or the coping strategies, defense mechanisms, and other behaviors that develop from the interaction of their personality and their social context (McAdams & Pals, 2006; McCrae et al., 2000). Engaging pre-service teachers in discussions about their personality traits, and how these impact the ways in which they respond to classroom situations, may be a small step in helping them feel better equipped to the challenges they will face in their careers.

Finally, since mastery experiences are such a key source of information for the development of self-efficacy beliefs (Bandura, 1993), it may be important that teachers' sense of mastery is grounded in the objectively measured quality of their performance in the classroom (Pianta, 2005). This suggests that pre-service teachers need opportunities to receive accurate, yet constructive feedback about their teaching performance during field placements in order to make well-balanced judgments about effective and less effective teaching moments. Though the scope of our study precludes causal statements, there are indications that when pre-service teachers do not have adequate, reliable information about mastery performances, they may be more likely to use other sources of information on which to base their sense of self-efficacy—their affective responses to classroom situations. In this situation, teachers may interpret their stress and anxiety as indicators of poor performance, and positive moods and emotions may enhance perceived self-efficacy.

Limitations and Future Research
Several limitations of this study deserve notice. First, the pre-service teachers

in this study were drawn from a single teacher preparation program, creating a sample whose results may not generalize to other pre-service teaching populations. Furthermore, the results of this study reflect only associations between teacher self-efficacy and observed performance, personality, and beliefs about children, and no causal inferences can be drawn. Shared method variance between our measure of teacher self-efficacy and measures of personality and beliefs, which were all taken from the same survey, may have inflated our results. Further investigations with data from multiple time-points, with self-reported and observed measures of teaching mastery are needed to further clarify and determine the direction of the relationships which were found. The ways in which constructivist teaching beliefs and experiencing mastery teaching performance work together in the development of teacher self-efficacy can especially be clarified through research using a longitudinal mediational model, which was not possible with our current data.

Conclusion

Teacher attrition results not only in great financial losses to the field of education (NCTAF, 2007), but also in a loss of teacher quality, with effective teachers leaving the field at higher rates than those who are less effective (Borman & Dowling, 2008). Learning more about the psychological processes which underlie teacher persistence and longevity might provide more evidence on which to build interventions to counteract this trend, especially among early career teachers (Tschannen-Moran & Woolfolk-Hoy, 2007). Teachers are all unique individuals with their own histories, personalities, and ideas, and they enter a very demanding and stressful career. Findings from this study contribute to the growing body of work suggesting that one possible avenue to consider in training effective teachers may involve helping teachers learn more about themselves and how their personalities and belief systems may contribute to their developing skills as educators.

Note

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