US-China Education Review B 1 (2011) 126-132
Earlier title: US-China Education Review, ISSN 1548-6613

Using the Sixteen Personality Factor Questionnaire to Predict Teacher Success

Rebecca S. Watts
Capella University, Minnesota, USA

Bob N. Cage, Valerie S. Batley, Debrah Davis
University of Louisiana at Monroe, Louisiana, USA

Faculty involved in pre-service teacher education often debate whether individual characteristics can predict effective teachers. Research is inconclusive with respect to the factors being capable of predicting effective teaching. This paper reports the results of a longitudinal study that identified self-reported characteristics of pre-service teachers during their semester of student teaching and their teacher effectiveness, as rated by their building principals after becoming employed as a teacher. Teacher scores on each of the 16 primary factors measured on the 16PF (personal factor) personality scale were regressed on their principals' effectiveness ratings. Stepwise multiple regression analysis generated a model that explained 17.0% of the variance in principal ratings of effectiveness and the model included four factors from the 16PF questionnaire as significant predictors of principals' success ratings. Those factors were: (1) Factor Q3, Perfectionism; (2) Factor Q4, Tension; (3) Factor N, Privateness; and (4) Factor G, Rule-consciousness.

Keywords: effective teachers, teacher preparation, teacher personality factors

Introduction

In the mid-1980s, a cry for better teachers in American classrooms was heard across the nation (Improvement anticipated in job market for teachers, 1984). This article in the chronicle of higher education suggested that increased school enrollments (attributed to the influx of baby-boomer babies) have greatly improved the educators' job market. These changes not only created a need for more teachers, but also for those individuals who could perform more effectively and efficiently in the classroom. Feistritzer (1984) concluded from his study of teacher education programs in the US that at least half were inadequate in preparing good teachers due to the lack of entry and exit requirements.

Rod Paige, US Secretary of Education in 2002, stated that the "Meeting Highly Qualified Teachers Challenge" report to Congress revealed that state certification systems allowed too many teachers who lacked solid subject area knowledge into the classroom. In addition, the National Center for Education Statistics found that 50% of teachers have left the profession within five years of their first jobs (National Commission on Teaching and America's Future, 2003), and Karge (1993) stated that 40% of new teachers left after only two years.

The critical need for preparing effective teachers has been and continues to be a major concern. College faculty involved in pre-service teacher education often debate whether successful teachers can be identified and

Rebecca S. Watts, Ed.D., Core Faculty, School of Education, Research and Doctoral Processes, Capella University.
Bob N. Cage, Ph.D., professor, Department of Educational Leadership, University of Louisiana at Monroe.
Valerie S. Batley, Ed.D., assistant professor, Department of Educational Leadership, University of Louisiana at Monroe.
Debrah Davis, instructor, Department of Educational Leadership, University of Louisiana at Monroe.

whether successful teaching can be predicted. Thus, a means of predicting successful teachers from pre-service experiences in current teacher education programs would address these two issues. Haberman (1993) stated, "Schools should be built better and kept up better than banks because there's more wealth in them. But no matter how important the facilities (and they are extremely important) what matters most is the quality of the teachers" (p. 1). Predicting teacher quality, that is predicting the successful teacher, is the focus of this paper. Specifically, the purpose of this study was to determine if the 16 primary factors measured on the 16PF questionnaire can predict teacher success as evaluated by principals.

Review of Related Literature

Heller and Clay (1993) included the following measures as predictor variables in their study on teacher effectiveness: (1) years of teaching experience; (2) cumulative college grade point average; (3) NTE (national teacher examinations) scores for the professional knowledge, general knowledge, communication skills and specialty area subtests; (4) SAT (Scholastic Aptitude Test) scores in English and math; and (5) ranks in high school graduating class. The principals' ratings of the teachers' overall teaching effectiveness served as the criterion variable. They found low correlations (r = -0.02 to 0.24) between the criterion and predictor variables; however, those correlation estimates of 0.18 to 0.24 were significant at the 0.05 alpha level. The sample size (N = 36) may explain the significance of these estimates. The best predictors were college GPA (Grade Point Average) and NTE professional knowledge scores; correlation coefficients for both variables were reported as r = 0.24. When data were analyzed using stepwise multiple regression, the group of predictor variables did not explain a significant amount of the variances in teaching effectiveness. Heller and Clay concluded that neither individual predictor variables nor variables as a group were appropriate for predicting teacher success. This conclusion supported previous findings by Schalock (1988) who stated, "We are essentially without any reliable predictors of that who will or will not be good teachers" (p. 8).

In an effort to identify the characteristics of successful urban teachers, Sachs (2004) developed an instrument to measure the attributes of pre-service teachers that contributed to their successes in the urban classroom. Her study revealed that "the five hypothesized teacher effectiveness attributes (socio-cultural awareness, contextual interpersonal skills, self-understanding, risk taking and perceived efficacy) did not discriminate between highly effective and less effective urban teachers" (p. 182). She admitted that the attributes taken together may be a "measure of teachers' resilience rather than their effectiveness" (p. 184).

Pratt (1987) studied 100 teachers who graduated from college in 1971. He compared attributes of those graduates who remained in the teaching force after 13 years of employment to those who had dropped out. The only variable to discriminate the two groups was a pre-admission interview score collected prior to entering the teacher education program. Graduates who remained in teaching tended to score higher on the interview score as pre-service teachers than those who had dropped out of teaching. Variables that did not discriminate were gender, age at the beginning of the teacher education program, undergraduate degree and length of program (i.e., a three-year or four-year degree).

Shechtman (1989) studied 97 teacher education majors in the School of Education at Haifa University, Israel. Predictor variables included: (1) a group assessment procedure score determined at the time of admission to the college program; (2) scales A, B, E and H from Cattell's 16PF questionnaire; (3) two matriculation scores consisting of the average of the applicants' high school grades and matriculation examination scores; and (4) an intelligence score. Criterion variables were PTE (practice teaching evaluation) scores and college

GPA. The only predictor variable that significantly correlated with PTE was the group assessment procedure score; the overall impression of the interviewers was the strongest and best predictor of PTE ($r = 0.45$, $p \leqslant 0.01$). Overall impression of the interviewers was also the strongest and best predictor of college GPA ($r = 0.40$, $p \leqslant 0.01$). These findings were consistent with those of Pratt (1987) in that interview data prior to admission to the program were the best possible predictors of success.

Glass's study (2002) involved predicting the success of teachers based on student achievements. His study brings to the review of related research disclaimers about predicting teacher success. Glass divided previous research into two categories: micro-studies and macro-studies. Micro-studies use data from individual teachers and macro-studies use data from groups of teachers. Glass stated that research involving the NTE found low correlations between NTE scores and teachers' grade-point averages or principals' ratings of teachers' qualities, and negative correlations with grades for practice teaching. He also indicated that researchers suggested that professional evaluations were "unreliable or biased or distorted by friendships or prejudices or unsophisticated views of quality teaching" (p. 159). His research indicated the following: (1) "Paper-and-pencil tests are not useful predictors of teaching candidates' potential to teach successfully and should not be used as such"; (2) The academic record of undergraduates is not a "useful predictor of their eventual successes as teachers"; (3) "Students of regularly licensed teachers achieve at higher levels than those of emergency certified teachers" and "more experienced teachers produce higher student achievements than less experienced teachers"; and (4) "The selection of teachers who will best contribute to their students' academic achievements should focus on peer and supervisor evaluation of interns, student teachers, substitute teachers and teachers during their probationary period" (p. 171). Glass's study implies the need for developing instruments that steer clear of tests and rely on the evaluations of pre-service teachers to determine their possible successes in the classroom.

While the interest in being able to predict teacher success has been ongoing, researchers have struggled with finding an instrument that would do so. In 1952, Barr indicated that Cattell's 16PF questionnaire had been used in research as a measurement for predicting teacher success. Using data from teachers and principals, Haberman (1991) identified eight mid-range functions as characteristics of satisfactory-or-better teachers. Among these functions were organizational skills, stamina, planning and discipline. Despite these findings, Haberman stated that "Written tests of personality could not predict that who would be an effective teacher" (p. 1).

Purpose of the Study

As schools are being held increasingly more accountable for student achievements, teacher preparation programs are also being held accountable for the quality of teachers that graduate from their programs. University faculty and accreditation agencies seek to identify those factors that characterize effective teachers in order to deliver programs that will meet the needs of new teachers. This study seeks to identify the specific personality factors that characterize successful teachers.

Methodology

The 16PF questionnaire was administered to approximately 300 student teachers in six different universities. Using school faculty directories, an effort was made to identify the schools in which these student teachers were employed. For those students whose employment status could be verified and who had taught for three years, the researchers mailed a five-point Likert scale to their current principals. Each principal was asked to evaluate the success of the teacher under his/her supervision for the entire three-year period using the Likert scale (see

Appendix). Due to the lack of current addresses and the fact that some teachers had not been with the same principal for the full three years, only 77 principal ratings were recorded.

Scores on each of the personality factors in the 16PF were considered as independent or predictive variables. The principal rating was considered as the dependent or criterion variable. These data were analyzed using stepwise multiple regression methods to determine if any of the 16PF personality factors were significant predictors of the principal's perception of teacher effectiveness, as measured by the principal's rating on the five-point Likert scale, after three years of teaching.

Instrument

The 16PF questionnaire was developed and first published by Cattell in 1949 (Cattell, 1978). The instrument has been widely used in research, and revised on four different occasions since originally published. The inventory is used worldwide and has been translated into 40 languages. The 16PF is comprised of 16 primary factor scales and five global factor scales that were developed through factor analysis. The 16PF has been effectively applied in a wide variety of research settings including industrial and organizational, clinical and counseling, and educational ones. These applications have resulted in a wide range of prediction equations for criteria, such as creativity, leadership, interpersonal skills, marital adjustment and an assortment of occupational profiles (Cattell, Eber, & Tatsuoka, 1970; Guastello & Rieke, 1993; Russell & Karol, 1994).

The fifth edition of the 16PF was used in this study. Test-retest reliabilities range from 0.69 to 0.87 with a median of 0.80. Internal consistency coefficients for the 16 primary factor scales yielded weighted averages ranging from 0.66 to 0.86 with a median of 0.75 (Cattell, 1994). Individual evidence of construct validity of the 16PF fifth edition primary scales was established by investigating the relationship between them and four external measures of personality. Validity coefficients demonstrated a high degree of correlation with the external instrument (Cattell, 1994).

Results

Raw scores for each of the 16PF factors were calculated according to the scoring instructions that accompany the questionnaire. The 16 factor scores were entered as predictor variables in the stepwise multiple regression analysis. Bendel and Afifi (1977) suggested that a more liberal probability level of 0.15 or 0.20 should be used in statistical regression analysis as opposed to the typical 0.05 criterion used for hypothesis testing. Thus, a probability level of 0.15 was used as the criterion for entry in the stepwise regression analysis.

Table 1 shows the linear regression models that were generated by stepwise entry of the variables at a probability level of 0.15. As seen in Table 1, four regression models were generated, and as indicated by the significant *F*-statistics, all models explained a significant amount of variance in the principals' ratings of teacher success. The coefficient of determination statistic (R^2), degrees of freedom (*df*) and *F*-statistic for each model are reported in Table 1 as well. Model 4 of the stepwise multiple regression analysis includes four of the 16PF factors as significant predictors of principals' ratings of teacher success. The four 16PF factors that were retained in model four included: (1) Factor G, Rule-consciousness; (2) Factor N, Privateness; (3) Factor Q3, Perfectionism; and (4) Factor Q4, Tension (see Table 2). This regression model explained 17.0% of the variance in principals' ratings of perceived teacher success. The standardized (β) and unstandardized (*b*) regression coefficients for each of these factor scores are shown in Table 2 along with the *t*-statistic and respective significance level associated with each coefficient.

Table 1

Model Summaries of Stepwise Regression Analysis for Variables Predicting Principals' Ratings of Teacher Success (N = 77)

Model	Sum of squares	*df*	Mean square	*F*	Significance
(1) Regression	3.923	1	3.923		
Residual	54.597	75	0.728	5.389	0.023[a]
Total	58.519	76			
(2) Regression	6.475	2	3.237		
Residual	52.045	74	0.703	4.603	0.013[b]
Total	58.519	76			
(3) Regression	8.479	3	2.826		
Residual	50.040	73	0.685	4.123	0.009[c]
Total	58.519	76			
(4) Regression	9.966	4	2.492		
Residual	48.553	72	0.674	3.695	0.009[d]
Total	58.519	76			

Notes. [a] Predictors: (Constant), PF Q3; $R^2 = 0.067$. [b] Predictors: (Constant), PF Q3, PF Q4, $R^2 = 0.111$. [c] Predictors: (Constant), PF Q3, PF Q4, PF G, $R^2 = 0.145$. [d] Predictors: (Constant), PF Q3, PF Q4, PF G, PF N, $R^2 = 0.170$. [e] Dependent variable: PRRATE.

Table 2

Coefficients for Stepwise Regression Analysis for Variables Predicting Principals' Ratings of Teacher Success (N = 77)

Model	Unstandardized coefficients		Standardized coefficients		Significance
	(b)	Standard error	*β*	*t*	
(Constant)	1.998	0.613		3.258	0.002
PF Q3	0.111	0.052	0.242	2.141	0.036
PF Q4	0.059	0.038	0.174	1.575	0.120
PF G	0.089	0.053	0.187	1.669	0.100
PF N	0.069	0.046	0.164	1.485	0.142

Note. Dependent variable = Principals' rating of teacher success.

The respective means and standard deviations (*SD*) for these four factors among the sample of teachers in the study are shown in Table 3 along with the corresponding norm group means and standard deviations compiled among male and female college students with an approximate age of 20. On Factor G, Rule-consciousness, the study group mean of 8.32 was more than two standard deviations above the norm mean. This suggests that these student teachers perceived themselves as strongly oriented to rules, procedures and social expectations. They believed in ethical and moral responsibility and dutifulness. High scores tended to be more rule or principle governed (Embree, 2007).

Table 3

Factor Means and Norm Group Means for Factors That Entered the Prediction Equation

Factor	Study group		Norm group [a]	
	Mean	*SD*	Mean	*SD*
PF G	8.32	1.85	4.46	1.67
PF N	4.78	2.09	5.59	1.93
PF Q3	7.75	1.90	4.92	1.77
PF Q4	6.48	2.57	5.68	1.74

Notes. [a] See Table 8.5, p. 179 in 16PF, fifth edition, "Technical manual", Cattell, 1994.

On Factor N, the study group mean was 4.78, which was approximately one-half standard deviation below the norm group mean. This factor, Privateness, has to do with self-disclosure. Low scorers characterized individuals who were more forthright, compared to the high scorers who were more discreet. Low scorers were seen as naive when they did not have the full picture of the job or the situation for which they were preparing (Embree, 2007). Thus, when surveyed during their student teaching semester, the group of 77 teacher education majors was more forthright than the norm group.

Low and high scores on Factor Q3, Perfectionism, can be differentiated in part according to whether the individual tended to be "task orientated" or "process orientated". High scorers, as was the case with the student teachers in this study, tended to be very organized, systematic and methodical. They were goal oriented and focused on conforming to socially accepted customs. High scores characterize individuals with considerable self-control of their emotions and behaviors. They are concerned with social reputation. These pre-service teachers, as a group, preferred high levels of structure and tended to have steady work habits. They were oriented towards starting tasks promptly, working first and playing second, and taking deadlines seriously. The mean score for the study group was approximately two standard deviations above that for the norm group. As indicated by the regression coefficients, this factor was more strongly related ($b = 0.111$, $t = 2.14$, $p < 0.05$) to principals' ratings of teacher success than the other 16PF factors that entered the model.

Factor Q4, Tension, tended to characterized individuals as demonstrating patience or impatience in response to environmental delays, stresses and demands. High scorers tended to be constantly busy, efficiency minded and driven to make things happen. Delays frustrate them. They wanted to get things done.

The resulting prediction equation can be expressed as follows: $\hat{Y} = 0.089\text{PF G} + 0.069\text{PF N} + 0.111\text{PF Q3} + 0.059\text{PF Q4} + 1.998$, where $\hat{Y}$ is the predicted principal rating of teacher success. The linear model explains 17.0% of the variance in principals' ratings of teacher success. The probability level used for entering variables into the regression question is established at $\alpha = 0.15$. The positive regression coefficients indicate that higher scores on the four 16PF factors should result in higher teacher success ratings by principals. Pre-service teachers who perceived themselves as perfectionist, organized and self-disciplined were likely to receive higher success ratings from their principals than those who perceived themselves as tolerating disorder, unexacting and flexible. Rule-conscious, conforming and dutiful pre-service teachers tended to receive higher success ratings from their principals than those who perceived themselves as nonconforming and expedient. Interestingly, those pre-service teachers who characterized themselves as private, discreet and non-disclosing were likely to be rated higher with regard to success than those who characterized themselves as forthright, genuine and open. Pre-service teachers who perceived themselves as tense, impatient, driven and possessing high energy tended to receive higher ratings from their principals as oppose to those who perceived themselves as relaxed, patient and composed. In a study, Haberman (1991) identified organizational skills, stamina, planning and discipline as functions characteristic of satisfactory-or-better teachers. These four characteristics are all high-range descriptors of the Perfectionism factor (Q3) on the 16PF. When interpretation of these four factors is juxtaposed with the principals' ratings of effective teaching, these factors may be considered as appropriate predictors of successful teachers when the factors are measured during the teachers' student teaching experience requirement of their teacher education programs.

References

Barr, A. S. (1952). The measurement of teacher characteristics and prediction of teaching efficiency. *Review of Educational*

Research, 22, 169-174.

Bendel, R. B., & Afifi, A. A. (1977). Comparison of stopping rules in forward regression. *Journal of the American Statistical Association, 72*, 46-53.

Cattell, H. E. P. (1994). Development of the 16PF (5th ed.). In S. R. Conn, & M. L. Rieke (Eds.), *16PF technical manual* (5th ed., pp. 3-20). Champaign, I. L.: Institute for Personality and Ability Testing, Inc.

Cattell, R. B. (1978). *Sixteen personality factor questionnaire (16PF)*. Champaign, I. L.: Institute for Personality and Ability Testing, Inc.

Cattell, R. B., Eber, H. W., & Tatsuoka, M. M. (1970). *Handbook for the 16PF*. Champaign, I. L.: Institute for Personality and Ability Testing.

Embree, M. C. (2007). *A summary of the 16PF first order factors*. Retrieved December 11, 2007, from http://www.uwmc.uwc.edu/psychology/16pf-summary.htm

Feistritzer, C. E. (1984). *The making of a teacher: A report on teacher education and certification*. Washington, D. C.: National Center for Education Information.

Glass, G. V. (2002). Teacher characteristics. In A. Molnar (Ed.), *School reform proposals: The research evidence* (pp. 155-174). Greenwich, Connecticut: Information Age Publishing.

Guastello, S. J., & Rieke, M. L. (1993). *The 16PF and leadership: Summary of research findings 1954-1992 (Technical report No. 2)*. Champaign, I. L.: Institute for Personality and Ability Testing.

Haberman, M. (1991, February). *A brief review of the history and development of the urban teacher selection interview*. Final Report to the U.S. Department of Defense on the Defense Reinvestment Initiative.

Haberman, M. (1993). Predicting the success of urban teachers (the Milwaukee trials). *Action in Teacher Education, 15*, 1-5.

Heller, H. W., & Clay, R. J. (1993). Predictors of teaching effectiveness: The efficacy of various standards to predict the success of graduates. *ERS Spectrum, 11*, 7-11.

Improvement anticipated in job market for teachers. (1984, February). *Chronicle of Higher Education*, 2-3.

Karge, B. (1993). *Beginning teachers: In danger of attrition* (Report No. SP 034 633, ERIC Document Reproduction Service No. ED 3600281). Atlanta, G. A.: American Educational Research Association.

Kerlinger, F. N. (1986). *Foundations of behavioral research* (3rd ed.). New York: Holt, Rinehart & Winston.

National Commission on Teaching and America's Future. (2003). *No dream denied: A pledge to America's children—Summary report*. Retrieved June 24, 2007, from http://www.nctaf.org/ documents/no-dream-denied_summary_report.pdf

Pratt, D. (1987). Predicting career success in teaching. *Action in Teacher Education, 8*, 25-34.

Russell, M. T., & Karol, D. (1994). *Administrator's manual for the 16PF* (5th ed.). Champaign, I. L.: Institute for Personality and Ability Testing.

Sachs, S. K. (2004). Evaluation of teacher attributes as predictors of success in urban schools. *Journal of Teacher Education, 55*, 177-187. Retrieved June 18, 2007, from http://jte.sagepub.com

Schalock, J. D. (1988). Teacher selection: A problem of admission criteria, certification criteria, or prediction of job performance? In W. J. Gephart, & J. Ayers (Eds.), *Teacher education evaluation* (pp. 1-22). Boston: Kluver Academic Publishers.

Shechtman, Z. (1989). The contribution of interpersonal behavior evaluation to the prediction of initial teaching success. *Teaching & Teacher Education, 5*, 243-48.

Appendix: Teacher Success Rubric

Use the rubric below to rate each teacher on these collective components of effective teaching.

(1) Commands to a knowledge of content and subject matter;

(2) Teaches to the needs of individual students;

(3) Plans effectively for classroom instruction;

(4) Maintains a well-managed classroom;

(5) Utilizes a variety of instructional and assessment techniques;

(6) Demonstrates a good work ethic and a high level of professionalism.

5—Demonstrated all of the time;

4—Demonstrated most of the time;

3—Demonstrated some of the time;

2—Demonstrated rarely;

1—Never demonstrated.