Perceived Effects of Teacher Personality Traits on Students' Mathematics Achievement: Case of Some Selected Junior High Schools in Wenchi Municipality in Ghana

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ABSTRACT

The study explored the perceived effects of teacher personality traits on Junior High School students' mathematics achievement in the Wenchi municipality of Ghana. The study was anchored on the Five-Factor Model of trait theory, and the design was descriptive correlational. The study sample comprised 367 randomly selected teachers. The researchers adapted the Revised NEO Personality Inventory (NEO PI-R) questionnaire to collect the data and analysed using the mean, multiple regression and Pearson r correlation coefficient tests. The results indicated Conscientiousness and Neuroticism as the most dominant and least teacher personality traits. All five factors were perceived to positively impact students' mathematics achievement, though insignificantly ($p = 0.05$).

Nonetheless, only Extraversion and Agreeableness traits significantly correlated positively with students' mathematics achievement. Being open to experience, conscientious, extravert, agreeable, and neurotic may be connected to students' learning and academic achievement but not significantly important. The study recommends the need for teachers to be sociable, energetic, friendly and optimistic. They must also be organised, systematic, hardworking, reliable and responsible.

Keywords: Teacher, personality traits, students, mathematics, achievement, Ghana

INTRODUCTION

In today's society, teachers perform important roles. Teachers positively impact a variety of short- and long-term outcomes for their learners, including academic performance on national assessments, health, extracurricular activities, attendance at school, adult earnings, and retirement savings (Kraft, 2019; OECD, 2020). Considering the pervasive influence of teachers, several studies have been conducted to offer a nuanced insight into the qualities that mark out, promote or inhibit their effectiveness (Gunasekara, Turner, Fung, & Stough, 2022; Nyatsikor, Sosu, Mtika & Robson, 2020). One factor that has promise for predicting teachers' effectiveness is personality traits, and this dimension has attracted research interest due to its potential to do so (Alegre, Pérez-Escoda, & López-Cassá, 2019; Perez-Gonzalez, Filella, Soldevila, Faiad, & Sanchez-Ruiz, 2022).

Personality traits demonstrate a person's uniqueness, feelings and actions typical of an individual (Cervone & Pervin, 2022; Corr & Matthews, 2020), and classroom teachers have an array of personality traits that significantly facilitate or inhibit their effectiveness in classrooms (Sims et al., 2021; Franz, Fackler &
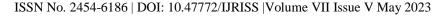
Paetsch, 2022). These personality traits have been found to positively or negatively influence teachers' effectiveness and competence moderated by factors such as their professional background, teaching experience, and school ethos (Nyatsikor et al., 2020).

Prior studies have suggested that a teacher's personality may have an impact on the quality of classroom instruction (Eryilmaz & Kara, 2017), the success of teaching and learning initiatives, novelty and enthusiasm of the students (Tan, Lau, Kung, & Kailsan, 2019), and student's academic achievement (Blazar & Kraft, 2017; Perera, Granziera & McIlveen, 2018). Academic success refers to student performance results, which demonstrate how the students have attained particular goals at the core of the instructional environment in educational institutions (Steinmayr, Meiner, Weideinger, & Wirthwein, 2014). The concept of academic achievement depends on the indicators used to quantify it because it is a multi-dimensional construct encompassing a wide range of educational outcomes. Models and theories of teaching and learning accept that context factors, including the characteristics of teachers and students, affect how students learn and their academic success (Eryilmaz & Kara, 2017; Steinmayr et al., 2014). Empirical evidence supports the role of teachers in the learning models, indicating that teacher characteristics are the strongest contributor to student achievement among many others (Hattie, 2009; Judge, Rodell, Klinger, Simon & Crawford, 2013). Personality traits are assumed to be particularly relevant for predicting academic performance at higher levels of education because the predictive power of cognitive ability might be reduced at this educational level due to the restricted range of intelligence scores (Trapmann, Hell, Hirn & Schuler, 2007; Furnham, Chamorro-Premuzic & McDougall, 2003). This assumption is founded on the premise that many jurisdictions, including Ghana, have systems of education where the personal touch, closeness and 'power' of teachers on their learners appear to wane as they climb up the ladder of education from early grade through to the Junior and Senior High Schools. This assumption has been given credence by several studies (Hirsh & Peterson, 2008; Chomorro-Premuzic & Furnham, 2008; Marcela, 2015).

However, in many educational and psychological studies, characteristics of the samples used, the educational systems, and other peculiar contextual differences and conditions decrease or increase the significance and pervasiveness of specific psychological variables on learning outcomes (Tolmie, Muijs & McAteer, 2011; Hox, Moerbeek & van de Schoot, 2017). A careful review of the literature on personality studies reveals diverse conclusions. However, these studies dominantly relied on samples from the developed world (Perez-Gonzalez et al., 2022; Smidt, 2015). With significantly different educational, cultural and social systems in Ghana, it is educationally relevant to explore an existing area of study using significantly different sample characteristics. Gaining knowledge from this may further consolidate or interrupt the universality of the influence of certain personality traits on achievement.

In the Ghanaian context, Junior High School [JHS] is the transition point to secondary, where students have less contact with teachers concerning their teaching and learning than in primary schools. The researchers wonder whether teachers' traits may be significant to learners' achievement levels with the increasing opportunities created for JHS learners to take bigger responsibilities for their learning which reflect in their levels of achievement in school or national-level assessments. Personality may be considered a theoretical construct aimed at describing, explaining, and predicting how human beings' function in various aspects of life. Of the various psychological paradigms, the five-factor personality trait is the most frequently used to assess dimensions such as neuroticism (emotional stability), extroversion, agreeableness, conscientiousness, and openness to experience (intellect) (Kusnierz, Rogowska & Pavlova, 2020; Fuertes et al., 2020). These traits have been hypothesised by theorists to have considerable effects in engineering and regulating the disposition of a person to act and behave in given circumstances. Against this background, the study has been conceptualised to examine teachers' personality traits in some selected schools in the Wenchi municipality and assess their effects on students' mathematics achievement.

Research Questions

The study answered two research questions and a hypothesis.

1. What personality traits are possessed by teachers in Wenchi municipality?
2. How do the five-factor personality traits impact students' performance?

Hypothesis

Ho: There is no statistically significant relationship among the five-factor personality traits and student performance.

H_1: There is a statistically significant relationship among the five-factor personality traits and student performance.

THEORETICAL REVIEW

The evolution of trait theory in the 1930s brought different conceptualisations of the term ''trait'' (Coasta & McCrae, 2008; Coasta & McCrae, 1992). However, McCrae (2018) defines traits as biologically-based dispositions that shape a person's distinctive adaptation to life and, thus, lead to relatively consistent patterns of thoughts, feelings, and actions over time. It has been found that as much as 80% of the trait variance is steady across the adult lifespan (Coffman & Gonzalez, 2002; Terracciano et al., 2006). The trait theory examines the whole person by identifying unique and enduring patterns of thoughts, feelings, and behaviours and revealing the mechanisms underlying those patterns (Noftleet al., 2011). The theory also determines how people's personalities develop and change over time (McCrae, 2011). This study is anchored on the Five-Factor Model [FFM] of the trait theory, which suggests that teachers' distinctive traits in Wenchi municipality are most likely to be attributed to their levels of impact on the learners entrusted to them. FFM is a taxonomy of five higher-order personality traits that are believed to be responsible for people's differences: Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism [OCEAN] (John, Naumann & Soto, 2008; Lanning, Pauletti, King & McAdams, 2018).

2.1 Openness to experience: Individuals identified with this trait generate new and interesting ideas and have creativity, a high level of imagination and intellectual curiosity. Such people are open-minded and think independently and untraditionally. Traits such as originality, imagination, adventure, idealism and enthusiasm identify such people (Costa & McCrae 1992).

2.2 Extraversion: People energised in reaching out and interacting with other individuals and external worlds. Such individuals preferred personal interactions and mood states that are more intensely experienced. Traits such as being sociable, energetic, friendly, optimistic and talkative are their major hallmark (Rollings, Micheletta, Van Larr, & Waller, 2022).

2.3 Agreeableness: People with better interpersonal skills get along with and build trust with other individuals to ensure social harmony. Such people identify with trust, friendliness, cooperation, affection, kindness and sympathy (Furnham, 2017).

2.4 Conscientiousness: People with a sense of direct control and regulate their emotions to work towards goals and plan effectively and want to achieve high success to avoid suffering. Such people are potentially related to impulse control, discipline, and persistence. Traits identifying such people include organised, systematic, hardworking, reliable and responsible (Shrestha & Dangol, 2020).

2.5 Neuroticism: People labelled as vulnerable to experiencing one or more negative feelings and effects from stress are known as emotionally unstable. This state is associated with levels of personal adjustment and emotional instability, mainly regarding self-perception, self-esteem, response to emotional distress, openness to experiences, tolerance and appreciation of new ideas and experiences. These people are identified with personality traits that reflect antagonism, self-rejection, moodiness, insecurity and anxiety (Kwon & Weed, 2007).

LITERATURE REVIEW

The Five-Factor Model [FFM] has been identified to relate to various behaviours (Nauzeer & Jaunky, 2021; Song & Shi, 2017). The value of the relative convergence by researchers as an organising framework of personality makes it a good starting point as a valid and reliable source of determining and measuring personality and predicting academic performance among students in the classroom (Cooper et al. 2014). The FFM proposes that five personality domains describe differences in people's behaviour, thoughts, motivations, and emotions (Kim, Dar-Nimrod & Caroyn-MacCann, 2018). Given this, teacher personality predicts their self-efficacy at the pre-service and in-service stages (Jamil, Downer, & Pianta, 2012; Ripski, Locasale-Crouch, & Decker, 2011). At the tertiary education level, teacher personality is associated with student evaluations of effective teaching (Kim & MacCann, 2016).

Teachers' academic and personal support to students is rooted in a specific type of personality (Kim, Dar-Nimrod & Carolyn MacCann, 2018). For instance, conscientiousness positively correlates to student achievement and intrinsic academic motivation and is less related to students' procrastination (Kertechian, 2018). Similarly, meta-analyses have consistently suggested that higher conscientiousness corresponds with a better GPA (e.g. McAbee & Oswald 2013; O 'Connor & Paunonen 2007). Datu, Yuen, and Chen (2018) also concluded that understanding one's personality is a prerequisite to determining performance on the subject matter studied. Hence, there is a need to integrate and understand an individual's well-being and psychological capabilities.

Several studies have demonstrated a positive relationship between agreeableness and GPA (e.g. Farsides & Woodfield 2003; Komarraju, Karau, & Schmeck, 2009) though the findings from other studies did not corroborate this relationship (McAbee & Oswald 2013; O'Connor & Paunonen 2007).

Prior studies have established a nuanced positive effect of conscientiousness on study satisfaction (Kunsting, Neuber, & Lipowsky, 2016; Smidt, 2015), ultimately leading to higher achievement. For extraversion, previous research (e.g. Smidt, 2015; O 'Connor & Paunonen, 2007) has not supported a consistent effect of extraversion on GPA. There appear to be disparate findings regarding the effect of extraversion on study satisfaction. However, Smidt (2015) posited positive associations between extraversion and study satisfaction. The relationship between neuroticism and GPA has generally been non-significant (e.g. McAbee & Oswald 2013; O'Connor & Paunonen 2007). However, divergent results have also occurred: Mayr (2011) reported a negative influence, whereas Komarraju, Karau, and Schmeck (2009) found neuroticism to have a positive influence on GPA. Most studies found that neuroticism had a negative influence (Trapmann et al., 2007). Studies establishing a connection between openness and GPA have been disparate. For example, McAbee and Oswald (2013) could not uncover substantial association, whereas O'Connor and Paunonen (2007) and Mayr (2011) indicated that openness contributes a minute positive influence to GPA. Regarding study satisfaction, Logue et al. (2007) could not unearth openness had an influence, whereas Mayr (2011) reported positive relations.

However, these divergent results and conclusions are not novel since the differences in contextual factors such as sample characteristics and size used for the study, methodology and significance level matter in psychological and educational studies (Meyer & Benavot, 2013; Bashir & Bala, 2018).

Variables

Independent Variables

The independent variables for the study are five teacher personality traits linked to the Five-Factor Model of personality, as explained in the theoretical review section. These five variables of personality traits (i.e. Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism) are believed to be responsible for people's differences in different domains and dimensions of behaviours, skills and abilities (Djigić, Stojiljković & Dosković, 2014; McCrae & Costa 1992; Lanning, Pauletti, King & McAdams, 2018).

Dependent Variable

The dependent variable for the study was students' performance assessed by the teachers using an adapted student academic achievement scale (Steinmayr, 2014). The scale has nineteen items measuring students' language and mathematical abilities on a five-point scale ranging from 1, the lowest score, to 5, the highest score. The adapted scale was pre-tested and achieved a co-efficient reliability of .8, indicating good internal consistency in measuring the construct.

METHODOLOGY

Design, Sample and Sampling

The study used a quantitative method with a descriptive correlational design. The sample was determined using Yamane's (1967) formula; n = N/1+Ne^2, Where N = total population and e = level of precision based on a 95% confidence level. The study used a sample size of [n = 4481/1+4481$(0.05)^2$] = 367 out of 4481 teachers in Wenchi municipality calculated at a 95% confidence level. The nine education circuits of the district were stratified, and simple random sampling was employed to select the recommended sample for the study. The adapted Revised NEO Personality Inventory (NEO PI-R) five-point Likert questionnaire of Costa and McCrae (1992) was administered to the teachers to assess their Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Items in the questionnaire covered biographic information of the respondents, the extent of dominance of the five-factor personality traits possessed by the teachers and the impact of the five-factor personality traits possessed by the teachers on students' academic performance. The questionnaire was personally distributed to the respondents after they had been briefed and consented to be part of the study. The respondents were given 24 hours to complete and return the questionnaires to the authors. The data solicited from the respondents was edited, coded and analysed using SPSS version 25. Descriptive statistics (mean and standard deviation) and standard multiple regression were used to answer the research questions, while the hypothesis was tested using Pearson's (*r*) correlation test.

RESULTS AND DISCUSSION

5.1 Research Question 1: *What personality traits are possessed by teachers in Wenchi municipality?*

To identify the dominance of the five-factor personality dimension of classroom teachers, respondents were asked to rate the extent to which they possess the five-factor personality dimension using Likert scale questions, with 1 showing the least rating to 5 showing a strong rating. The mean and standard deviation of the responses given by the respondents were analysed using mean rank, and the results are presented in Table 1.

Table 1.0: The Five-Factor Personality Traits (FFPT) possessed by the teachers in Wenchi Municipality (N=173)

FFPT	M	SD	Rank
Conscientiousness	4.125	0.711	1
Openness to experience	3.863	0.898	2
Agreeableness	3.695	0.901	3
Extraversion	3.575	0.861	4
Neuroticism	2.565	1.236	5
Grand Mean	**3.564**	**0.921**	

5.2 Research Question 2: How do the five-factor personality traits impact the student's performance?

The perceived impact of teachers' five-factor personality traits on student performance was analysed using the standard multiple regression test, and the result presented in Table 3.0

Table 2.0 Multiple Regression Analysis showing the impact of the five-factor traits on students' academic performance

Variables		SE	t	p-value
Openness to experience	0.016	0.051	0.313	0.755
Conscientiousness	0.021	0.039	0.528	0.598
Extraversion	0.016	0.084	0.187	0.852
Agreeableness	0.068	0.082	0.833	0.406
Neuroticism	0.006	0.028	0.228	0.820
Constant	3.440	0.275	12.526	0.000

Dependent Variable: Student Academic Performance

Hypothesis

Ho: There are no statistically significant relationships between the five-factor personality traits and student performance.

A Pearson Product-Moment Correlation Coefficient analysis was conducted to test the hypothesis, and the results are presented in Table 3.

Table 3: Pearson Product-Moment Correlation Coefficient showing the relationship between the five-factor personality traits and student performance.

Factors	1	2	3	4	5	6
Students' Performance	1					
Openness to experience	0.040	1				
Conscientiousness	0.099	0.220*	1			
Extraversion	0.149*	0.040	0.303*	1		
Agreeableness	0.164*	0.050	0.326*	0.860*	1	
Neuroticism	0.007	-0.054	0.031	-0.051	-0.075	1

*p < 0.05

The results in Table 1 suggested that teachers in the study area possessed the five-factor personality traits, and conscientiousness ($M = 4.125$, $SD = 0.711$) was the most pervasive among them, followed by openness ($M = 3.863$, $SD = 0.898$), through to the neuroticism ($M = 2.565$, $SD = 1.236$) which was the least. The standard multiple regression of the factors showed that all positively impacted students' performance, albeit insignificantly. Openness to experience [$\beta=0.016$, p-value=0.755>0.05] indicates that a teacher's openness to experience positively impacts student performance. In other words, if a teacher's Openness to experience increases by one unit, student performance will increase by 0.016. Conscientiousness [$\beta=0.021$, p-value= 0.598>0.05] indicates that a teacher's consciousness positively impacts student performance. In other words, if a teacher's consciousness increases by one unit, student performance will increase by 0.021. Extraversion [$\beta = 0.016$, p-value = 0.852 > 0.05] indicates that a teacher's Extraversion positively impacts student performance. In other words, if a teacher's Extraversion increases by one, student performance will increase by 0.016. Agreeableness [$\beta = 0.068$, p-value = 0.406 > 0.05] indicates that a teacher's Agreeableness positively impacts student performance. In other words, if a teacher's Agreeableness increases by one, student performance will increase by 0.068. Neuroticism [$\beta=0.006$, p-value=0.820 > 0.05] demonstrates that the neuroticism of a teacher is related to performance. This shows that if neuroticism is increased by one unit, performance will increase by 0.006 in the study area. While it is worth noting that teacher personality traits impact student performance, traits alone are not only instrumental in reinforcing student performance, as other factors influence students' performance. The correlations among variables showed that each was positively related to student performance. However, only Extraversion ($r = 0.149$, df = 174, $p < 0.05$) and Agreeableness ($r = 0.164$, df = 174, $p < 0.05$) were the factors with statistically significant associations with student performance. These findings support prior studies reporting positive relationships between agreeableness and students' GPA (Roloff, Klusmann, Ludtke, & Trautwein, 2020; Franz, Fackler, & Paestsch, 2022; Komarraju, Karau, & Schmeck, 2009). Teachers who demonstrate the tendencies of agreeableness are inclined to reinforce their student's performance. Similarly, Openness to Experience, Conscientiousness, and Neuroticism were the non-significant factors with correlation coefficients of 0.040, 0.099, and 0.007. The results did not establish a significant correlation between Openness to experience, Conscientiousness, and Neuroticism with student performance, suggesting that those traits are not strongly related to student performance. The findings, in part, also contradict extant literature that has reputed conscientiousness to positively correlates to student achievement and intrinsic academic motivation and is less related to students' procrastination (Kertechian, 2018). Meta-analyses have consistently shown that higher conscientiousness corresponds with a better GPA (McAbee & Oswald, 2013; O 'Connor & Paunonen, 2007).

Instructively, the study's findings are quite revealing and interesting because most empirical evidence abounds in the extant literature, making a strong argument for a statistically significant relationship between

five-factor personality traits and performance. For instance, several studies have established a statistically significant relationship between conscientiousness and performance (Kusnierz, Rogowska & Pavlova, 2020; Fuertes et al., 2020). However, this study makes a clear departure from these findings, making a unique contribution to the literature. This may reinforce the role of contextual differences and sample characteristics in psychological studies of this nature.

CONCLUSION AND IMPLICATIONS OF THE STUDY

The study investigated the distribution of the five personality traits among teachers in the Wenchi Municipality of the Bono region in Ghana and found conscientiousness and Neuroticism as the most and least dominant traits, respectively. Moreover, all five traits were perceived to positively impact students' performance, albeit insignificantly. Teachers with dominant *Extraversion* and *Agreeableness* personality traits were perceived to positively influence students' performance. To enhance teaching and learning in schools, teachers should not lose sight of the fact that teaching revolves around effective relationships between them and learners. Hence the need to be sociable, energetic, friendly and optimistic. They must also be organised, systematic, hardworking, reliable and responsible.

Similarly, this study undoubtedly seeks to increase teachers' and other major stakeholders in the Ghanaian educational system's awareness of the major roles of personality traits in the educational process, particularly with the pedagogical practice, selection of future teachers, their education and subsequent professional development and the evaluation of the teachers' success. A nuanced understanding of the effects of the teachers' personality traits will invariably moderate students' performance and success in Ghanaian Basic schools.

Limitations of the study

It is important to highlight that the association between the five factors and students' performance is based on respondents' perceptions and not empirical achievement data.

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