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Relationship between Personality Trait Introversion-Extroversion and Academic Achievement in Science Subjects among Secondary School Students in Tanzania

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Abstract

While *extrovert* individuals tend to obtain their energy from other people, and they love talk, they interact, participate, lead, and socialize, *introvert* individuals direct their energy and attention inward and reflect on their own thoughts, memories, and feelings. Based on the introversion-extroversion personality characteristics, the present study sought to determine who performs better in science subjects between introverts and extroverts, and demonstrate these relationships by gender. The assumption was that while science classrooms require a great deal of interaction among the learners, these contrasting dimensions of personality trait could be reflected in classrooms and bear some implications on students' learning and achievement. We employed a modified Eysenck Personality Questionnaire (EPQ) to identify students' personality (N=345) along introversion-extroversion scale and correlated these with their academic performance obtained from their National Form Two (Grade 9) Exam which is considered of high quality and standard. A comparison *within* sex revealed that introvert girls performed significantly better than extrovert girls whereas extrovert boys performed significantly better than introvert boys. When a comparison was made *between* sexes, it was revealed that extrovert boys had significantly higher grades compared to extrovert girls while introvert girls had significantly higher grades compared to introvert boys. Overall then, the study revealed a statistically significant correspondence of higher grades with introvert girls and extrovert boys, and lower grades with extrovert girls and introvert boys. The study

implications and suggestions are made to inform instruction, guidance, and intervention.

Keywords: Personality trait, Introversion, extroversion, Academic achievement,

1. Introduction

The present study explored the relationship between personality trait *introversion-extroversion* and academic achievement in science subjects among secondary school students in Tanzania. The study sought to demonstrate how introversion-extroversion, a personality trait in a continuum, relates with students' academic achievement through identifying who performs better between introverts and extroverts and demonstrate these relationships by gender. The intention was to bring to the attention of educators in general and teachers, in particular, the existence of these relationships in Tanzanian classrooms in order to help them take a step further in assisting students with respect to their personality characteristics/behaviors.

While the relationship between personality and academic achievement has been well-documented (Boroujeni, Roohani, & Hasanimanesh, 2015; Furnham, Chamorro-Premuzic & Moutafi, 2005; Hilliard, 2001; Horak, 2016), little is known regarding how personality works with gender dynamics in influencing students' learning and achievement (see also Wilson, Smart, & Watson, 1996; Furnham & Chamorro-Premuzic, 2005). At the same time, literature is full of evidence showing that environmental factors such as socio-cultural aspects surrounding a person play a considerable role in shaping and/or determining individual's personality and personality behaviors that he or she would demonstrate (Church, 2002; Hofstede, 2001; Hong, Morris, Chiu, & Benet-Martinez, 2000; Triandis & Suh, 2002). In a situation where the expected behavior of individuals by the society is such that ideal men would show aggressiveness, outward orientation, talk more, lead, and instruct (extroverted orientation), whereas ideal women would talk less, be humble, share, give help, and show support (introverted orientation) (Osorio, 2014; URT, 2011), it was interesting to learn how introversion-extroversion personality trait would mingle with gender in shaping students' attainment of school subjects such as science (see also Kahle & Lakes, 1983). While it was not the intention of the present study to cheer up social construction of gender that encourages suppressive masculine male traits (Sondergaard, 2005), the study sought to specifically learn how these relationships would translate into science classroom where a great deal of meaningful engagement and interaction both in the classroom and out-of-classroom learning is required regardless of gender.

Furthermore, issues of personality and personality tests have increasingly become part of life in the developed world, affecting decision-making at the organizational, judicial, and academic levels (Horak, 2016; Prieto, 2006; UNESCO, 2017). However, this has not been the case in the developing world where such considerations are rarely taken, and student differences by personality or socio-cultural background are mostly never considered to bear an influence on teachers' classroom pedagogy. The present study sought to challenge the taken-for-granted aspect of this negated or unconsidered influence of personality characteristics on student learning, and subsequent academic achievement in an African context such as Tanzania. In doing so, the study aimed to investigate, and through data

analysis raise concern for considering students' personalities, which is one of the important aspects in guiding students toward the successful accomplishment of their academic endeavors. In fact, as research suggests elsewhere (Boroujeni, Roohani, & Hasanimanesh, 2015; Duff, Boyle, Dunleavy & Ferguson, 2004; Martin, Montgomery, & Saphian, 2006; Thomas & Gadbois, 2007), there is a clear link between student personalities and academic achievement. Ultimately, an understanding of how personality and academic achievement relate within the realm of gender would provide a more lucid framework for predicting academic attainment, risks, and possibilities (Hakimi, Hejazi, & Lavasani, 2011; Nguyen, Allen, & Fraccastoro, 2005), and offer a means to effective methods of teaching, assessment, and intervention (Prieto, 2006).

1.1 Personality and Learning

The idea that a relationship exists between individuals' personalities and how s/he would learn and perform within the realm of academics is not new. A plethora of research has associated the best understanding of students' learning styles with an understanding of their personality characteristics (Borg & Shapiro, 1996; Chamorro-Premuzic & Furnham, 2008; De Raad & Schouwenburg, 1996; Fish & Mackeen, 1985; Nelson, 1996; Mathews & MacLeod, 1994; Messick, 1984; Vedel & Poropat, 2017). It has been maintained that the personality characteristics of students largely determine their ways of learning, which in turn, affect their learning outcomes. For example, more than 30 years ago, Messick (1984, p. 61) suggested that an individual's learning style can be thought of as a "characteristic self-consistency in information processing that develops in congenial ways around underlying personality trends". On the other hand, De Raad and Schouwenburg (1996) pointed out the fact that association between personality traits and objective indices of behavior provides the basis for explaining differences in how individuals approach various learning tasks. They further asserted that personality traits, serve as "directors or blocks for students' motivation and learning strategies" (p. 186). Several empirical studies have found support for these assertions (Borg & Shapiro, 1996; Fish & Mackeen, 1985; Hakimi, Hejazi, & Lavasani, 2011). For instance, in their study on learning and instructional styles among students in the economics of education class, Borg and Shapiro (1996) found that, learning as well as instructional styles differed among introvert and extrovert students and their teachers. A lack of understanding of students' learning characteristics was enough to cause students' learning discomfort as well as instructors' misjudgment of students' capacity to learn. Thus, Borg and Shapiro concluded their study by calling for the need to understand and consider various personality behaviors that students bring with them to classrooms for effective classroom instruction (Borg & Shapiro, 1996).

During the last two decades, a consensus about the basic personality traits emerged. Popularly known as the "Big-Five", the model suggests five dimensions important in describing human personality. These include extroversion, neuroticism, agreeableness, conscientiousness, and openness to experience (Costa & McCrae, 1992; De Raad & Schouwenburg, 1996; Duff, Boyle, Dunleavy, & Ferguson, 2004). These personality traits or dimensions tend to exist in a continuum in such a way that individuals could fall anywhere along the scales: introversion-extroversion, neuroticism-emotional stability,

agreeableness-antagonism, conscientiousness-undirectedness, or open to experience-not open to experience (Costa & McCrae, 1992; Pervin & John, 1999). While studies have indicated that these dimensions tend to be stable across the life span, directly relate to behavior, and seem to have both physiological and psychological base (Eysenck, 1991; Goldsmith, 1997), recent research has added that the traits might well be shaped and influenced by the external environment (Caspi & Roberts, 1999; Duff, 2003; Ramsden, 1992) and more specifically, by the individuals' culture and value systems (Choi, et al., 2015; Hofstede & McCrae, 2004; Hogan & Bond, 2009).

Empirical studies have indicated that three of the "Big-Five" personality traits; extroversion, conscientiousness, and openness to experience, are relevant to educational settings and have shown a significant positive relationship with students' learning and achievement (Blickle, 1996; De Raad & Schouwenburg, 1996; Chamorro-Premuzic & Furnham, 2008; Saphian, 2006; Thomas & Gadbois, 2007; O'Conor & Paunonen, 2007). For instance, *conscientiousness* has been related to work discipline, interest in subject matter, concentration, and considering studying as quite easy (Chamorro-Premuzic & Furnham, 2008). It has also been associated with the use of a strategic approach in learning such that conscious students are said to be good at organizing their work, managing their time, and work hard in their studies (Blickle, 1996). *Openness* to experience has been linked with questioning and analyzing arguments; use of deep approach to finding deeper meaning in the texts; critical and logical analysis of learned materials, and relating what is learned to the previous knowledge (Blickle, 1996; Duff, Boyle, Dunleavy, & Ferguson, 2004). Moreover, Mathews, Deary, & Whiteman (2003) observed that because *extroverts* receive motivation to learn from their external environment, they tend to do better with collaborative learning, consultation, and discussion with others. It is this latter personality trait, Extroversion, and hence extroversion-introversion, which is the concern of the present paper, and will be discussed further in the next section.

1.2 More about Introversion-Extroversion and Learning

Most obviously then, people utilize elements of personality dimensions in their daily lives. With respect to this study, the concern was how the introversion-extroversion personality dimension determines how students approach learning tasks and deal with them (in diverse environments such as in a classroom, laboratory, or any other outdoor learning settings) so much so that they end up performing at certain level academically. It was believed that by virtue of their personality characteristic behaviors, introverts and extroverts would perceive and approach learning tasks differently, and this would bring significant implications on their learning outcomes.

Empirical work advancing on Jung's theory of personality (Jung, 1937 in Myers and Myers, 1980) characterize *Introverts* as directing their energy and attention inward and receive energy from reflecting on their thoughts, memories, and feelings. They typically hide their inner world and rarely let others know them, and their needs. On the contrary, *Extroverts* are said to obtain their energy from other people and are drained by being alone. They love to talk, participate, organize, and socialize. They are people of actions (De Raad &

Schouwenburg, 1996; Duff, Boyle, Dunleavy, & Ferguson, 2004; Hilliard, 2001; Meisigier & Murphy, 1989). In the light of these characteristics, the main question that this study was asking was - which type of a person will, in this case, end up with a good performance in science, an introvert or an extrovert. According to Anderson (1992), the answer depends on the whole range of the subject matter, the teaching-learning environment, as well as the sociocultural expectations that surround the learner. This study intended to go further to look into these relationships by gender.

Drawing examples from one of the big five personality traits, Hilliard (2001) for example, found that extrovert learners learned best through talking and physically engaging the environment. Talking helped their thoughts to form and become clear, and their attention always flew towards external things and events. In the classroom environment, Hilliard found extroverts to thrive well when they were allowed to discuss or work with other students and excel with learning activities that have visible results and involved people interactions. On the contrary, Hilliard (2001) found that introverted students enjoyed reading, lectures, and written over oral work. They preferred to work independently, did well at verbal reasoning, and needed time for internal processing. They enjoyed listening to others talk about the topic while privately processing the information. Hilliard (2001) observed further that, introverted students encountered difficulty with instructors who speak quickly without allowing time for mental processing. They were often uncomfortable in discussion groups and hesitated to speak up in class. In general, Hilliard found introverts to excel when they worked independently with their thoughts, through listening, observing, reading, and writing, and were more comfortable if they were not required to speak in class but allowed to voluntarily make their contributions.

In the same vein, Mathews, Deary, and Whiteman (2003) observed that extroverts tended to show superior performance to introverts on some tasks particularly the relatively demanding tasks, requiring divided attention, and resistance to distraction or interferences. On the contrary, they observed that introverts performed better in some tasks requiring vigilance and certain kinds of problem-solving skills. Furthermore, in their study on neurobiology of the structure of personality in the UK, Depue and Collins (1997) observed that in the teaching and learning environment, extroverts enjoyed affiliation with others and were motivated to achieve goals. They were in the frontiers and often *deprived* introverts of the chance to participate, a situation which created a propensity for introverts to perform behind their rival extroverts. Thus, Depue and Collins (1997) characterized extroverts as “geared to respond” and introverts as “geared to inspect”.

Taken together, the review above shows that students’ personalities and in this case, their personality traits, which constitute their consistent behaviors, determine in a large measure, their learning behaviors. The nature of the task and the learning settings have also been highlighted as blending factors, combining with personalities in shaping students’ learning and achievement. It is in the light of this, that the present paper argues that, personality traits such as introversion-extroversion could be an important determinant of the classroom as well as outdoor work behaviors that might influence students’ learning and achievement in science subjects. Consequently, going further to investigate how this personality trait would blend

with gender and gender dynamics in influencing students' achievement was crucial in informing classroom instruction and learning of the school science subjects in Tanzania where no such studies have been previously undertaken.

1.3 Theoretical Framework

The present study sought to examine the influence of personality trait *introversion-extroversion* on students' academic achievement in science subjects in Tanzania, and demonstrate it by gender. The assumption was that introversion-extroversion personality traits could interact with gender under the influence of culture and learning context to determine students' achievement. More specifically, the nature of the curriculum, teaching strategies, forms of assessment, and physical structures was assumed to have considerable influence on introverts' and extroverts' learning orientation and approaches to the learning tasks (see also Humphreys & Revelle's, 1984; Ramsden's, 1992).

From the point of view of social cognitive theories of personality, behavior is explained as being guided by cognitions and expectations about the world, and especially those about other people (Mischel, 1999). Bandura (1977) suggested that the forces of memory and emotions, work in conjunction with environmental influences in shaping the individual personality. On the other hand, while trait theorists are concerned with the stability of personalities as determined by traits (Mathews et al., 2003), they also believe that personalities are *relatively* stable over time and place (Buss, 1989; Hall et al., 1999; Mathews et al., 2003; Vedel & Poropat, 2017). It follows then that, trait theorists would accept that an individual's behavior naturally varies somewhat from occasion to occasion but would also maintain that there is a core of consistency that defines the individual's true nature (Mathews et al., 2003). In other words, trait theorists believe that there are stable differences between individuals which are apparent across a variety of contexts and situations. It was therefore assumed that culture and social construction of gender in Tanzania would play a significant role in shaping introverts' and extroverts' ways of approaching learning and learning tasks, both in class and out-of-classroom settings, which would, in turn, affect their learning outcomes/academic achievements.

This study investigated the relationship between personality traits *introversion-extroversion* and academic achievement in science subjects while taking into consideration gender dynamics as background variables. The aim was to bring to the attention of teachers and educators, the existence of these relationships so that they are convinced to find out different ways in which to help their students learn better based on their personality characteristics.

The following specific objectives were the focus of the inquiry:

a) To assess if introverts perform better than extroverts

Hypothesis: *There would be no significant difference in performance in science subjects between introverts and extroverts*

b) To examine if there are differences in performance between boys and girls of the same personality trait (Assessment *between* sex)

Hypothesis: *There would be no significant differences in science performance between boys and girls of the same personality trait*

c) To examine if there are differences in academic performance between boys of different personality traits and girls of different personality traits (Assessment *within* sex)

Hypothesis: *There would be no significant difference in performance between boys of different personality traits and girls of different personality traits.*

2. Method

2.1 Participants

The participants in this study were Form Three (Grade 9) secondary school students taking science subjects (chemistry, biology, and physics) from Tanzania. The rationale behind choosing this class laid upon the fact that at this level, students have gone through their National Form Two (Grade 8) Examination which is prepared by the National Examination Council of Tanzania to cover all content studied in form one and two, and thus, administered to all form two students in the country as they transition from grade 8 (Form Two) to grade 9 (Form Three). It was found logical and appropriate to use students' academic performance from a common academic test so as to maintain consistency in making correlations. This examination is considered of high quality and standard. Four, Form Three streams were, therefore, purposefully selected from four different secondary schools, located in Dar es Salaam and Kilimanjaro, Tanzania. Purposive sampling was used in order to ensure that schools selected had well-equipped science laboratories that were in use because the study was focusing on science subjects. A total of 345 students were involved in filling out the 27-item modified Eysenck Personality Questionnaire (EPQ) which was administered during regular class time taking approximately 40 minutes. Thus, the study sample constituted 162 females and 183 males aged between 15 and 17 years, with a mean age of 16. This sample was considered representative of Form three secondary school students in Tanzania

2.2 Instrument

In order to measure students' personality along the introversion-extroversion scale, the study employed the modified Eysenck Personality Questionnaire - EPQ (Eysenck, 1985; Francis, 1996; Francis & Jackson, 2004), where some of the items in the scale were rephrased in order to keep up with the context in which the study was undertaken. The instrument consisted of 27 items divided into two subscales: Activity (15 items) and Sociability (12 items). Whereas items in the activity scale related to how individuals behave when in different engagements, sociability scale items related to how individuals behave when interacting with other individuals. Items in the activity scale were trichotomous requiring students to mark among *yes*, *maybe*, or *no.* The lowest score on this scale was expected to be 0 and the highest 15, with a mean score of 7.5. Items in the sociability scale were in the multiple-choice form requiring students to choose and circle one among five options. The lowest score on this scale was 12 and the highest 60, with a mean score of 42.5. An individual measuring above the mean score inactivity and sociability total was considered an *extrovert*, whereas the one who

measured below the mean score was considered an *introvert*. The following are examples of items in each scale:

Sociability:-

1. When I am alone,
    a) I feel very comfortable
    b) I feel quite comfortable
    c) I feel just fine
    d) I feel somewhat uncomfortable
    e) I feel totally uncomfortable

Activity:-

1. Do you like organizing and initiating leisure activities?

    Yes ☐ May be ☐ ☐No

2.3 Students' Academic Performance

As noted earlier, records of students' academic performance in science subjects (physics, chemistry, and biology) were taken from the National Form Two Examination results. These were obtained from the regular school records, kept diligently by all schools in the country. However, they were supplemented and validated against those available in the National Examination Council of Tanzania-Head Office. The general students' performance ranged from 12% ("F" grade) to 92% ("A" grade), with a mean average of 52%. In order to obtain a students' marks/grade that would be used for correlation purposes, the average score was calculated from the scores obtained by an individual in the three science subjects. For the purpose of this study, this grade was taken as the individual's performance in science.

2.4 Statistical Analysis

Analysis began by computing Cronbach's alpha coefficient for the internal consistency, and examination of the internal structure validity through principal component factor analysis in order to verify reliability and validity of the modified EPQ. This was important because some items in the instrument were slightly changed/ customized to fit the social and cultural contexts of Tanzania. This was followed by the calculation of Pearson correlation coefficients meant to assess the statistical significance of the univariate relationship between introversion-extroversion (represented by activity and sociability subscales), gender, and student's academic performance. Gender was treated as a dichotomous variable with females coded 1 and males 2. Having assessed the relationship among the study variables and identified introvert and extrovert students (by gender), an independent sample t-test was run to assess if there was a significant difference between the mean scores (mean performance) of introverts and extroverts. This was run between and within gender as required by the study objectives.

3. Results

3.1 Validation of the EPQ

Validation of the modified EPQ was completed through the examination of its internal structure validity as well as internal consistency reliability. In order to assess its internal structure validity/construct validity, factor analysis was carried out on the scores of the 27 items using principal component factor analysis with oblique rotation in which two components were obtained. With exception of three items, other items (24 items) demonstrated high loadings on either of the two components. Two out of the three items loaded on both components, hence decided that they are incorporated in the component in which they demonstrated high loading. The remaining item did not demonstrate significant loading in any of the two components, thus, dropped off from further analysis. A comparison between this scale and the original EPQ showed that all items fell under the same respective components (i.e. *Activity* or *Sociability* subscales) as in the original EPQ questionnaire except one item which reallocated to sociability from the activity scale. This was, however, considered of negligible effect on the overall analysis since the overall instrument was actually measuring the same aspect of behavior/personality. All 26 items loaded above 0.4 and most of them, between 0.7 and 0.8, demonstrating the fact that the modified EPQ maintained its psychometric properties, that is, construct/internal structure validity. The loadings of items on the two factors (subscales) are as shown in Table 1.

Table 1. Pattern Matrix showing item loadings in the two subscales

	Component	
	1[b]	2[c]
Restlessness	0.357	**-0.871**
Walking pace	-0.265	**-0.825**
Climbing stairs	0.213	**-0.801**
Working pace	-0.23	**-0.801**
Enjoy sitting doing nothing	-0.158	**0.737**
Do many things	0.442	**0.663**
Sleep late	-0.24	**-0.624**
Lack Motivation	-0.455	**0.562**
Hurrying get to places	-0.29	**-0.558**
Finish meals	0.337	**0.552**
Done than you	-0.281	**0.522**

Watch sports than playing	-0.018	**0.459**
Rush to activities	-0.396	**0.442**
Initiating Leasure	0.331	**-0.413**
Agitated for waiting	*0.079*	*-0.025*
Enjoyment of small talks	**0.878**	0.125
Efficiency of working	**0.834**	0.156
Feeling at parties	**0.828**	0.134
Relating with intimate friends	**0.809**	0.218
How strangers find me	**0.783**	0.459
Dealing with strangers	**0.756**	0.233
Tendency to share tips or tricks	**0.743**	0.129
Closeness to people	**0.738**	0.172
Feel of being alone	**0.703**	0.079
Forming new social interaction	**0.687**	0.164
Nature of people like me	**-0.505**	0.262
Preference of working	**-0.455**	0.216

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 10 iterations. b. Sociability. c. Activity

The reliability of the modified EPQ was also examined through SPSS and a summary of the descriptive properties is as shown in Table 2. Scores on the two scales forming the modified EPQ showed a satisfactory level of internal consistency reliability as evidenced by values of Cronbach's (1951) alpha coefficients of 0.91 for sociability and 0.75 for the Activity scale. This confirmed further that the modified EPQ was still an appropriate measure of students' introversion-extroversion personality trait in the context of this study.

Table 2. Descriptive statistics for the two sub-scales of EPQ

Scale	No. of items	Mean	*SD*	Coefficient alpha
Activity	15	28.34	4.59	0.75
Sociability	12	33.02	8.30	0.91

Note. N= 345.

3.1 Distribution of Respondents along the Introversion-Extroversion Scale

Having verified the psychometric properties of EPQ, the next step was to identify students' personalities along the introversion-extroversion scale that is, introvert students and extrovert students. This was important as it would then make possible the comparative analysis of introversion-extroversion personality traits versus academic achievement, which was the core of the study. As was stated in section 2.2, students who scored below the mean in the activity-sociability scale total were considered *introverts* whereas those who scored above the mean were considered *extroverts*. Table 3 presents the distribution of respondents along the introversion-extroversion scale.

Table 3. Distribution of students by Sex, Introversion, and Extroversion

Personality Trait	Gender	*N*	Percentage by Gender (%)	Percentage by Trait (%)
Introverts	Male	81	42.25	51.88
	Female	98	54.75	
Extroverts	Male	102	61.45	48.12
	Female	64	38.55	

3.1 Correlation between the Study Variables

Although studies have attempted to demonstrate, in different ways, the relationships between sex/gender, personality measures of introversion-extroversion, and academic achievements, as literature has shown in the present paper, it was considered worthwhile to examine the same in the context of the present study. More clearly, it was thought that it would be illogical to examine academic differences between introverts and extroverts, without actually demonstrating the relationships between these variables and academic achievement in the context of the present data.

Table 4. Correlations between Sex, Activity, Sociability, and Academic performance

	Sex	Activity	Sociability	Sum of Activity and Sociability	Academic Performance
Sex	1	.279**	.260*	.305**	.246*
Activity		1	.314**	.908**	.799**
Sociability			1	.482*	.252**
Sum of Activity Sociability				1	.684**
Academic					1

** Correlation is significant at p < 0.01

* Correlation is significant at p < 0.05

Patterns of the relationships between academic performance and the three variables namely, sex, activity, sociability, and the sum of activity and sociability are as shown in Table 4. As it can be observed, sex correlated significantly with the academic performance although the correlation coefficient seemed to be low, $r = 0.25$, $p < 0.05$). Individual activity correlated with academic performance at $r = 0.79$, $p < 0.01$ whereas sociability correlated with academic performance at $r = 0.25$, $p < 0.01$. This showed that activity had more predictive power on academic performance than sociability. However, the two sub-scales positively correlated with one another at $r = 0.31$, $p < 0.01$ showing that they were good predictors of each other. Further, the inter-correlation between activity and sociability and the sum of the two was found to be r=0.91, p<0.01, and r=0.48, p<0.05 respectively. This, further, confirmed the fact that the two scales were measuring the same aspect of behavior. Moreover, it was interesting to note that the correlation between the sum of activity and sociability and academic performance maintained high at r=0.68, p<0.01. Together, these results confirmed that introversion and extroversion correlated well with the individuals' academic achievement, and in this case, achievement in science subjects.

3.2 Comparing Performance between Introverts and Extroverts – Overall

The first objective of the study required a demonstration of the difference in performance without taking gender into consideration. Regardless of gender, it was hypothesized that there would be no significant difference in performance in science subjects between introverts and extroverts. As presented in Table 5, statistical analysis showed that this hypothesis was supported. An independent sample t-test comparing the two groups found that overall, there was no significant difference in performance in science subjects between introverts (M = 54.22, SD = 15.31) and extroverts (M = 48.14, SD = 14.69); t (345) = .53, p = .59 (two tailed).

Moreover, the calculated magnitude of the differences in mean performance according to Cohen (1988) (mean difference = 6.08, 95% CI: -5.75 to 1.52) was found to be very small (eta squared = .003), confirming further that, when gender was not a factor, the differences in performance between introverts and extroverts was not statistically worthwhile. However, as it will be seen later, this was not the case when differences in performance between the two personality trait dimensions were sought by gender/sex.

Table 5. Difference in science performance between Introverts and Extroverts

Group Statistics

	Category	N	Mean Score Average (%)	Std Deviation	Std. Error Mean
Personality	Introverts	179	54.22	15.31	2.05
	Extroverts	166	48.14	14.69	2.01

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Introvert/ Extrovert	Equal var. assumed	3.39	0.17	.53	342.13	.59	6.08	2.90	-5.75	1.52
	Equal var. not assumed			.57	337.51	.42	6.08	2.89	-5.61	1.48

3.3 Comparing Introversion-Extroversion and Academic Performance "Between" Sexes

The second objective required a demonstration of the difference in academic performance

between the sexes. That is, comparing the performance of extrovert boys and extrovert girls as well as introvert boys and introvert girls. The hypothesis was stated that there would be no significant difference in performance in science subjects between boys and girls of the same personality dimension. Results in Tables 6 and 7 demonstrate this comparison. With regard to extrovert boys and extrovert girls (Table 6), an independent sample t-test conducted to compare the two groups showed that there was significant difference in performance between extrovert boys (M = 52.32, SD = 11.44) and extrovert girls (M = 43.96); t (166) = 2.95, p = .004(two tailed). The strength of the difference was further calculated (mean difference = 8.36, 95% CI: -1.32 to .57) and according to Cohen (1988), rated as small (eta squared = .02).

Table 6. Comparing science performance between Extrovert boys and Extrovert girls Group Statistics

Category	Sex	N	Mean Score Average (%)	Std Deviation	Std. Error Mean
Extroverts	Boys	102	52.32	11.44	2.83
	Girls	64	43.96	16.41	2.76

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower / Upper
Extroverts	Equal var. assumed	1.51	0.06	2.95	163.54	.004	8.36	4.00	-1.32 / 0.57
	Equal var. not assumed			2.91	162.07	.004	8.36	3.91	-1.25 / 0.49

Likewise, Table 7 shows the mean difference in performance between introvert boys and introvert girls. This time, an independent sample t-test conducted to compare the two groups,

inverted the results, where unlike extrovert girls, introvert girls performed significantly higher (M = 53.63, SD = 13.03) than introvert boys (M = 45.20, SD = 16.47), t (179) = 3.03, p = 0.003(two-tailed). The strength of the difference was calculated (mean difference = 8.43, 95% CI: -3.10 to 1.47) and found to be small (eta squared = .02) according to Cohen's (1988) criteria.

Table 7. Comparing science performance between Introvert boys and Introvert girls

Group Statistics

Category	Sex	N	Mean Score Average (%)	Std Deviation	Std. Error Mean
Introverts	Boys	81	45.20	16.47	2.79
	Girls	98	53.63	13.03	2.65

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Introverts	Equal var. assumed	1.24	1.13	3.03	176.78	.003	8.43	3.94	-3.10	1.47
	Equal var. not assumed			2.97	176.02	.003	8.43	3.74	-3.05	1.39

3.4 Comparing Introversion-Extroversion and Academic Performance "within" Sex

The third objective required demonstration of the difference in academic performance in

science subjects *within* sex; that is, comparing the performance of extrovert and introvert boys as well as the performance of extrovert and introvert girls. It was hypothesized that there would be no significant difference in performance between boys and girls of different personality dimensions. Results in Tables 8 and 9 demonstrate this comparison. With regard to extrovert and introvert boys (Table 8), an independent sample t-test conducted to compare the two groups found that extrovert boys had significantly higher average scores (M = 52.32, SD = 11.44) compared to introvert boys (M = 45.20, SD = 16.47); t (183) = 3.05, p = .003 (two-tailed). The strength of the difference was calculated (mean difference = 7.12, 95% CI: -0.48 to 3.26) and found to be small (eta squared = .01) according to Cohen's (1988) criteria.

Table 8. Comparing science performance between Introvert and Extrovert Boys

Group Statistics

Sex	Category	N	Mean Score Average (%)	Std Deviation	Std. Error Mean
Boys	Introverts	81	45.20	16.47	1.61
	Extroverts	102	52.32	11.44	1.52

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Introverts	Equal var. assumed	1.97	0.18	3.05	180.68	.003	7.12	2.28	-0.48	3.26
	Equal var. not assumed			3.03	179.45	.003	7.12	2.15	-0.43	3.11

Similarly, Table 9 gives a comparison between introvert and extrovert girls. An independent sample t-test results showed that introvert girls performed significantly higher (M = 53.63, SD = 13.03) compared to extrovert girls (M = 43.96, SD = 16.41); t (162) = 3.02, p = .002 (two-tailed). The calculated strength of the difference (mean difference = 9.67, 95% CI: -4.03

to 1.30) was found to be small (eta squared = .02) according to Cohen (1988) criteria.

Table 9. Comparing science performance between Introvert and Extrovert Girls

Group Statistics

Sex	Category	N	Mean Score Average (%)	Std Deviation	Std. Error Mean
Girls	Introverts	98	53.63	13.03	2.32
	Extroverts	64	43.96	16.41	2.17

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
									Lower Upper
Introverts	Equal var. assumed	3.57	0.09	3.02	159.89	.002	9.67	3.28	-4.03 1.30
	Equal var. not assumed			2.91	157.16	.002	9.67	3.07	-3.95 1.22

Despite the consistent small strength of the difference between the comparison groups (the effect size), in general, results of the present study indicated that while extrovert boys performed better than introvert boys in science, girls reversed the phenomenon where introvert girls performed better than extrovert girls. In other words, this analysis has shown that extroversion has potentially higher predictive power for better performance in male students whereas introversion has potentially higher predictive power for better performance in female students in science subjects.

4. Discussion and conclusion

The study presented in this paper aimed to explore the relationship between personality trait - introversion-extroversion and academic achievement in science subjects among secondary school students in Tanzania. Results showed that there was a significant difference in performance between girls and boys of the different dimensions of this personality trait. Introvert girls performed better than introvert boys, and consistently, better than their counterpart extrovert girls. Likewise, extrovert boys performed better than extrovert girls, and consistently, better than their counterpart introvert boys. This way, introversion was considered to potentially predict girls' better performance in science, whereas, extroversion was considered to potentially predict better performance in boys. These results are consistent with trait theorist who although they believe that personality traits are relatively stable over time (Cobb-Clark & Schurer (2012), they also accept that their disposition may vary over time and from place to place based on the culture and context in which individuals are exposed (Thomson, 2005; Mathews *et al*., 2003; Vedel & Poropat, 2017).

Given these results, it would then be logical for one to ask how, and perhaps, why would introversion favor girls and extroversion favor boys, and particularly in such context as that of this study? A study conducted by Peterson and Finneman (2000) found that learning habits that involved working independently while collaborating with peers were the only way that enabled female students to do better in mathematics and sciences. These learning behaviors according to them, involved carefully choice of what task to do and persist at it until it was accomplished. In their investigation on men and women learning styles, Goldberg and Tarule (1996) described the feminine learning styles that fit well with introverted women leading to their better academic achievement. According to them, when introverted women hear a new or different idea, they set their doubts and disbeliefs aside and tune in carefully to what others are saying. They try to see it from the other persons' viewpoint and understand their opinions as completely and deeply as possible. They cognitively go with them, wanting to hear the other person's views and understand why they think that way. Introvert women seek to make sense of new ideas to grasp how they can be seen as accurate and useful. According to Goldberg and Tarule (1996), this is their way of knowing which involves empathy with the speaker so as to cooperatively assimilate and internalize the truth together, thus make easier the grasp of the concepts and ideas. Greyson (1988) found that introverted women were always an advantage in learning situations because of their tendency to dislike superiority discourses, believe and working with others arguments, but without interfering or influencing their thinking.

Talking about relating culture, personality, and performance, Myers (2000) pointed out that this is like assessing who we are, what and how we do, and the outcome of the two. Citing Emerson (1941), Myers (2000) added that the ancestor of every action that we do is our thought. According to Myers, everything that we do starts from our thoughts, feelings, and beliefs, and consistently, they become successful when they form a part of what society expects of us. Children are brought up to identify with and to prefer the appropriate behavioral patterns relevant to their ascribed gender roles attached to them by society.

In many African societies, Tanzania included, the gender roles and behavioral expectations attached to people tend to shape their ways of behaving in such a way that an ideal African woman, for instance, would be expected to demonstrate behaviors closely related to introversion dispositions. In African culture, women are supposed/ expected to be kind, tender, caring, fond, and in some cases, submissive (Cornwall, 2005). In their everyday conversation, they are expected to be less interruptive, more sensitive, politer, less cocky, and able to tolerate others (Akure 2016; Cornwall, 2005). These dispositions are obviously associated with introversion behavior. On the contrary, extroversion in women is likely to be associated with misbehavior, disobedience, mischievousness, and the one that facilitates breaking of the rules of the society. An extrovert woman may seem to be uncivilized, uncouth, ill-mannered, and foul-mouthed (Cornwall, 2005). It is this society's expectations on women behavior which is likely to favor introverted girls, thus, make them feel accepted, and find themselves in a comfort zone with an added motivation to learn and work hard and eventually perform better as what the present study has found.

On the other hand, according to Cornwall (2005) and Akure (2016), in many African societies, men tend to be found in the roles that demand social and physical power. They are the main speakers on family and social matters, and in any case, when subjected to a group constituting both genders, it turns out that they are automatically expected to lead and drive. A man behaving sluggishly, unable to say and lead in matters related to society is likely to be labeled with all negativities (Cornwall, 2005). Consequently, the cultural expectations of the society and the believes associated with it, again favors and gives credit to extroverted oriented men. It is thus, highly likely that in a learning situation such as in a science classroom, where a great deal of interaction and engagement is required, will favor extroverted oriented men as they would be in their social comfort zone.

Results of this study, have confirmed that a relationship exists between personality traits such as introversion-extroversion, and academic achievement in such subjects as science, and more particularly, in such contexts where there is a close relationship between personality behaviors/characteristics and what the society favors. Discerning by gender, the study has further shown that when gender orientations blend with personality orientations in a learning situation, some groups may likely be favored over others. Given this, an attempt to recognize and find out how personality behaviors, especially those 'amplified' by the social-cultural beliefs and expectations could be accommodated or taken care of in classrooms would not be worthless. In particular cases like Tanzania, where big classrooms and hence, overcrowded lab and group activities are a common encounter, taking care of student personality behaviors such as introversion-extroversion would be a worthwhile endeavor. Thus far, the findings of the present study could have important implications as far as the teaching and learning of science is concerned. These may include but are not limited to the need for teachers to find out ways to help their students with respect to their personality characteristics; students themselves be aware or be made aware of their personality characteristics so that they find what works better for them within their learning environment. Also, schools at large to play their role in socialization and development of better personality characteristics/behaviors especially those that will work better for all gender, in various aspects of learning.

References

Akure, P. M. (2016). *Personality traits, motivation and knowledge worker productivity* (Doctoral dissertation, University of the Witwatersrand, Faculty of Commerce, Law and Management, School of Economic and Business Sciences).

Boroujeni, A. A. J., Roohani, A. & Hasanimanesh, A. (2015). The impact of extroversion and introversion personality types on EFL learners' writing ability. *Academy Publication, 5*(1). http://dx.doi.org/10.17507/tpls.0501.29

Choi, D., Oh, I., & Colbert, A. E. (2015). Understanding organizational commitment: A meta-analytic examination of the roles of the five-factor model of personality and culture. *Journal of Personality and Culture, 100*(5), 1542-1561. https://doi.org/10.1037/apl0000014

Chonjo, P. & Welford, G. (2001). Reasons for Poor performance of students in A-level science examination in Tanzania. *Papers in Education and Development, 21*, 39-51.

Cobb-Clark, D. A. & Schurer, S. (2012). The Stability of big-five personality traits. *Economics Letters, 115*(1), 11-15. https://doi.org/10.1016/j.econlet.2011.11.015

Dasu, M.M. (2001). Effective Teacher Education for Effective Classroom Teaching. *Paper in Education and Development, 21*, 14-25.

De Raad, B & Schouwenburg, H. C. (1996). Personality in Learning and Education: A Review. *European Journal of Personality, 10*, 303-336. https://doi.org/10.1002/(SICI)1099-0984(199612)10:5%3C303::AID-PER262%3E3.0.CO;2-2

Devine, J. H. (1994). *Inter-Disciplinary Studies*. Indiana: The University of Southern Indiana Press.

Digman, J. M. (1990). *Personality Structure: Emergence of Five-Factor Model*. Annual.

Eysenck, H. J. (1991). Dimensions of Personality: 16, 5, or 3? – Criteria for a Taxonomic Paradigm. *Personality and Individual Differences,* 12, 777-790. https://doi.org/10.1016/0191-8869(91)90144-Z

Eysenck, M.W. & Eysenck, M.C. (1982). Memory Scanning, Introversion – Extroversion, and Level of Processing. *Journal of Research in Personality, 13*, 305-315. https://doi.org/10.1016/0092-6566(79)90021-7

Fish, R.S. & Mckeen, (1985). R.L. Accommodating different learning needs: Education at Community College. *Community/Junior College Quarterly of Research and Practice, 4*, 325-332. https://doi.org/10.1080/0361697850090403

Fraser, B.J. (1998). Science Learning Environments: Assessments, Effects, and Determinants. *International Handbook of Science Education*. London: Kluwer.

Gilligan, C. (1982). *In a Different Voice: Psychological Theory and Women's Learning*. Cambridge, MA: Havard University Press.

Goldberg, N. & Tarule, J. M. (1996). Men and Women Learning Styles. *Personality Psychology in Europe, 3*, 125-133.

Greyson, D. A. (1988). *Gender, Ethnic Expectation, and Students Achievement*. Des Moines. Iowa: Gray Mills Foundations.

Hakimi, S., Hejazi, E., & Lavasani, M. G. (2011). The relationship between personality traits and students' academic achievement. *Social and Behavioral Sciences, 29*, 836-845. https://doi.org/10.1016/j.sbspro.2011.11.312

Hilliard, D. (2001). Personality Types and Learning: Its Implications in the Classroom. *Journal of Personality Psychology, 54*, 456-465.

Hogan, R., & Bond, M. N. (2009). Culture and personality. In P. J. Corr & G. Matthews (Eds), *The Cambridge handbook of personality psychology* (pp. 577-588). New York, NY, US: Cambridge University Press.

Horak, S. (2016). Decision-making behavior, gender differences, and cultural context variables. *International Journal of Cross-Cultural Management*, *16*(3), 281-299. https://doi.org/10.1177%2F1470595816665131

Johnson, C.B. (1996). Personality Traits and Learning Styles: Factors Affecting the Academic Achievement of Gifted Students. *American Psychologist, 33*, 84-102.

Jung, C.G. (1939). *The Integration of Personality*. NewYork: Farrar and Rinehart.

Kahle, J. B. & Lakes, M. K. (1993). Gender and Personality Types in Science Classroom. *Journal of Research in Science Teaching*, *20*(2), 131-140.

Kohn, M. (1986). *Personality and Schooling*. Nordwood, NJ: Ablex.

Mathews, G. & Deary, I. J. and Whiteman, M. C. (2003). *Personality Traits*. Cambridge: Cambridge University Press.

Mathews, A. & MacLeod, C. (1994). Cognitive Approaches to Emotion and Emotion Disorders. *Annual Review of Psychology, 45*, 25-50.

Murray, H. A. (1938). *Explorations in Personality*. New York: Oxford University Press.

Myers. I. B. & Myers, P.B. (1980). *Gifts differing*. Palo alto, CA: Consulting Psychologists Press Inc.

Nelson, C. E. (1996). Students Diversity Requires Different Approaches to Teaching of Math and Sciences. *American Behavioral Scientist, 40*(1), 165-174. https://doi.org/10.1177%2F0002764296040002007

Pervin, L. A. (1985). *Handbook of Personality: Theory and Research*. New York: Guilford.

Peterson, P. L. & Finnema, E. (2000). Effective Teaching, Student Engagement in Classroom Activities, and Sex-Related Differences in Learning Mathematics. *American Educational Research Association Journal, 22*, 309-335. https://doi.org/10.3102%2F00028312022003309

Powell, K. (2003). Science education: spare me the lecture. *Nature*, *425*(6955), 234-237.

Seymour, E., & Hewitt, N. (1997). *Talking About Leaving: Why Students Leave the Sciences*. Boulder, CO: Westview Press.

Skinner, B.F. (1953). *Science of Human Behavior.* New York: Macmillan Publishers.

Thompson, J. A. (2005). Proactive personality and job performance: a social capital perspective. *Journal of Applied psychology*, *90*(5), 1011.

URT (2011). *A national gender diagnostic study in Tanzania*. Dar es Salaam: MCDGC.

Vedel, A., & Poropat, A. E. (2017). Personality and academic performance. *Encyclopedia of personality and individual differences*, 1-9.

Walberg, H. J. (1997). Educational Productivity: Argent Needs and New Remedies. *Theory into Practice, 33*, 75-82. https://doi.org/10.1080/00405849409543621

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