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Role of non-cognitive variables in learner performance among disadvantaged learners

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We acknowledge the existing educational inequalities that South Africa faces as a result of differences in developmental and equal educational opportunities. The aim with this study was to investigate the role of non-cognitive learning performance variables that affect the learning performance and success of secondary-school learners. Data were collected from a sample of 395 Grade 9 learners. The proposed learning performance structural model was empirically evaluated by using various instruments and was analysed by means of structural equation modelling. The results indicate statistically significant positive relationships between learning performance and cognitive engagement, learning performance and grit, cognitive engagement and conscientiousness, grit and learning motivation, grit and cognitive engagement, learning motivation and parental quality, learning motivation and tenacity, learning motivation and cognitive engagement, and conscientiousness and resilience. Both tenacity and parental quality acted as moderators of the relationship between environmental unfavourableness and cognitive engagement. The selection of variables was more effective in explaining variance in cognitive engagement than in learning performance. The results of the study could be used to facilitate cognitive engagement as a pivotal variable in learning success among secondary-school learners.

Keywords: disadvantaged learners; learning performance; non-cognitive variables; secondary school; South Africa; Western Cape

Introduction

More than two decades after the dawn of democracy, many South Africans are still reportedly unable to read, write, and compute at grade-appropriate levels, while the development of human capabilities and intellectual capital is key in building the economy, developing social infrastructure, and ensuring a prosperous future (Ramphele, 2012; Schleicher, 2010).

Research on poverty alleviation shows that low educational success is closely correlated to the prevalence of both poverty and inequality (Checchi & Van de Werfhorst, 2018). This suggests that the provision of quality education may present a sustainable solution to the eradication of inequality and poverty, as it instils the knowledge and skills that individuals require for entry into the modern labour market and sustainable job security (Blanden & Machin, 2004).

According to Spaull (2013), another concern in South Africa is the existence of two different public-school systems, with the smaller, better performing system accommodating the wealthiest 20 to 25% of learners, who on average achieve higher scores than the larger system of poorer learners. N Taylor (2011) found that scholastic success in South Africa is closely related to learners' socio-economic background. Learners in the top, wealthier, 20% of schools, are more likely to complete school (Amnesty International, 2020; Moses, Van der Berg & Rich, 2017; Spaull, 2013; Taylor, S & Yu, 2009). According to N Taylor (2011), it is evident that socio-economic status (SES) plays an exceptionally strong role in determining educational achievement in South Africa. It seems that the combined SES of the learners in a particular school may be even more important than a learner's own family background.

While it is important to understand the factors that contribute to learner failure and school dropout rates, it is equally important to understand the outcomes. Those learners who endured poor-quality schooling are severely hampered in exploiting training opportunities after school (Spaull, 2013) and their skills deficit is likely to lead to reduced employability (Pretorius, 2014).

We acknowledge the existing inequalities in South Africa and wish to contribute to the ideal of equal opportunities that so many South Africans strive for daily. The catalyst for this study was the observed challenges facing those South Africans who were previously denied developmental and equal educational opportunities. With this study we attempted to uncover the factors that should be considered when evaluating the learning potential of those most at risk of not achieving learning performance success, as well as prospective interventions to facilitate learning performance success.

According to pioneers like Bandura (1997), it is evident that non-cognitive factors have the potential to provide critical information about the typical performance of individuals facing certain challenging environments. To determine the factors that contribute to poor educational performance, we investigated the non-cognitive variables that influence the scholastic success of Grade 9 (aged 14–15) learners in disadvantaged communities in the Western Cape province of South Africa (Pretorius, 2014).

Literature Review

TR Taylor (1997) proposed a learning potential model in an attempt to describe the latent variables that jointly constitute learning potential. The model is a competency model, with two main competencies, namely transfer of knowledge and automatization. Knowledge transfer refers to the process by which crystallised abilities develop from the confrontation between fluid intelligence and novel stimuli, whereas automatization refers to performing tasks or parts thereof automatically, without much thought required. De Goede (2007) proposed an elaboration of the model by proposing a causal link between automatization and transfer of knowledge. He proposed abstract thinking capacity and information processing capacity as the main variables in learning performance. This model, however, is also limited to cognitive factors, and does not include non-cognitive determinants. We were convinced, however, that the listed cognitive variables are not the exclusive predictors of learning success, and that further cognitive and non-cognitive variables should be explored. Burger (2012) and Prinsloo (2013) found, for example, that conscientiousness, academic self-efficacy, learning motivation, academic self-leadership, hope, optimism, resilience, and time cognitively engaged have a significant effect on learning performance.

Given the introductory argument, the objective with this study was to identify non-cognitive variables that influence the scholastic success of secondary-school learners in disadvantaged communities in the Western Cape province of South Africa.

Conceptual Framework

The Learning Performance Structural Model that was developed and tested in this study shares the notion that learning performance is a multifaceted construct, which includes non-cognitive learning competencies and situational variables. The following non-cognitive variables were investigated in this study: cognitive engagement, conscientiousness, learning motivation, tenacity, grit, and resilience. The situational variables included environmental unfavourableness, and parental quality (Pretorius, 2014).

Learning performance

The dependent variable in this study, learning performance, refers to the degree of academic success that learners achieve within the context of the learning environment.

We wished to determine which non-cognitive learning competencies and situational variables contributed to differences in learning performance, based on the learners' academic performance at school. The actual results for four main subjects, namely Afrikaans Home Language, English First Additional Language, mathematics, and natural science were used as indicators of learning performance. The focus was on subjects where insight and knowledge transfer are required to perform successfully in the evaluation situation, instead of simply assessing memory. We decided to use the average score of the first and second terms' subject marks of the learners' Grade 9 academic year as composite indicator variables for learning performance. The average scores for each of these subjects were equally weighted in terms of their contribution to learning performance.

In the following sections, the non-cognitive variables considered to have an influence on learning performance are defined, followed by the rationale for their inclusion in the study.

From an overview of the extant body of knowledge we identified the following variables for inclusion in the structural model: learner engagement, conscientiousness, learning motivation, resilience, grit, tenacity, parental quality and environmental unfavourableness.

Learner engagement

According to Torto (2020), effective learning results when learners are effectively engaged in classroom learning activities. She refers to the three types of learner engagement that Fredricks, Blumenfeld and Paris (2004) have identified, which are behavioural, emotional and cognitive engagement. Learners who are engaged with the material at a high level of concentration more easily attain understanding, which is preferable to using memory as a mechanism to retrieve content (Burger, 2012). It is critical that learners in a learning situation expend effort on concentrating on their work, as engagement is directly linked to better learning and enhanced ability (Carini, Kuh & Klein, 2006).

Given the nature of the other latent variables in the study, we decided to focus on cognitive engagement as a facet of learner engagement:

H_1: Cognitive engagement positively influences learning performance.

Conscientiousness

According to Colquitt, LePine and Neo (2000), conscientious individuals are organised, reliable, hard-working, self-directed, punctual, scrupulous, ambitious, and show perseverance. Conscientious individuals can, therefore, be regarded as more engaged in their tasks and are also more motivated (achievement-striving) and focused on long-term success (e.g., achievement of a 3-year degree). Studies in the higher education sector consistently confirm the positive relationship between conscientiousness and learner engagement (Salgueira, Costa, Gonçalves, Magalhães & Costa, 2012).

The following hypothesis was thus formulated:

H_2: Conscientiousness positively influences cognitive engagement.

Learning motivation

Motivation manifests in an individual's behaviours that are not attributable to cognitive ability or external situational forces governing the direction, intensity, and persistence of action (Gibson, Ivancevich, Donnelly & Konopaske, 2006). Motivation is a choice by the individual to expend energy towards a behaviour (Nunes, 2003). According to Gibson et al. (2006), motivation can be considered a force that initiates and directs the behaviour of an individual. In our study the focus was on learning motivation.

The next hypothesis was thus formulated:

H_3: Learning motivation positively influences cognitive engagement.

Resilience

According to Newman (2005:227), the American Psychological Association (APA) has defined resilience as "the human ability to adapt in the face of tragedy, trauma, adversity, hardship, and ongoing significant life stressors."

Oshio, Taku, Hirano and Saeed (2018) have found a fairly strong correlation between conscientiousness and resilience. In similar vein, Froutan, Mazlom, Malekzadeh and Mirhaghi (2018) claim that conscientiousness and the rest of the big five personality traits (extraversion, agreeableness, openness, and neuroticism) accounted for 31.5% of the variance in resilience. The hypothesis could thus be formulated that conscientiousness not only influences learner engagement (Hypothesis 3), it also positively influences resilience.

H_{11}: Conscientiousness positively influences resilience.

Based on the preceding discussion the following hypothesis was also be formulated:

H_{12}: Resilience moderates the negative relationship between environmental unfavourableness and cognitive engagement.

Grit

Duckworth, Peterson, Matthews and Kelly (2007) define grit as a combination of trait-level perseverance and a passion to achieve long-term goals and show that grit predicts achievement in challenging domains over and beyond measures of talent. Grit is a non-cognitive behavioural trait that seems to be shared by most successful individuals (Duckworth et al., 2007). While grit overlaps with the achievement aspects of conscientiousness, it focuses more on long-term growth, not short-term success. Duckworth et al. (2007) found that grit demonstrates incremental predictive validity of success measures over and beyond conscientiousness. Duckworth et al. (2007:1098) note that "[g]ritty children work harder and longer than their less gritty peers and, as a consequence, perform better."

In contrast to tenacity, grit acts as a motivational driving force that affects the learning performance of learners. Against the background of the preceding overview of variables, the following hypotheses were formulated:

H_7: Grit positively influences learning motivation.

H_8: Grit positively influences cognitive engagement.

H_9: Grit positively influences learning performance.

H_{10}: The positive relationship between grit and learning performance is mediated by cognitive engagement.

Tenacity

A person who is tenacious can be described as an individual who pushes personal limits when faced with difficult challenges (Heckman, L 2003).

Tenacity is a non-cognitive behavioural trait that drives learning performance (Heckman, JJ & Rubinstein, 2001; Heckman, JJ, Stixrud & Urzua, 2006). Tenacity in academic studies manifests as persevering in working hard and smartly over an extended period, with a long-term view to achieving goals (Dweck, Walton & Cohen, 2014). Such learners consider school as a means to a future desired end. Challenges do not derail academically tenacious individuals, and they may consider setbacks as temporary, or as opportunities, and implement strategies for continuously moving forward (Dweck et al., 2014).

Lucas and Spencer (2018) provide an excellent overview of the role of tenacity in success in life, work, and education. It is, however, evident that tenacity is not behaviourally expressed in an untargeted way, therefore, learning motivation focused on a desired learning outcome will provide the rationale for the application of tenacity in educational settings.

Against the background of the variables discussed up to this point, the following hypotheses were formulated:

H_5: Learning motivation positively influences tenacity.

H_6: Tenacity moderates the negative relationship between environmental unfavourableness and cognitive engagement.

Parental quality

Parental quality in our study refers to the situational variable of parental support for their children's educational development. The underlying factors included (1) how often parents check their children's homework, (2) assist with homework, (3) offer incentives for good grades, (4) and expect of their children to complete high school.

According to Anderson (2003), children's educational outcomes rely heavily on cumulative support and investment in the child by family members and the broader community. In our study, this investment was limited to parents' contribution.

Parental quality is influenced by many variables, such as parents' level of education, income, their aspirations for their children's future, and their choice of school for their children.

Masten, Hubbard, Gest, Tellegen, Garmezy and Ramirez (1999) found that better intellectual functioning and parenting resources were related to more favourable outcomes across competency domains. They suggest that intelligence quotient (IQ) and parenting scores are markers of fundamental adaptational systems that protect child development in the context of severe adversity (Masten et al., 1999).

Driscoll (2006) investigated the support levels required for graduation success for learners from low socio-economic backgrounds. It was found that such learners benefited most from parental involvement in academic activities, enhancing the odds of their academic success. Driscoll (2006) also found that learner-parent communication enhanced the likelihood of graduation success among those learners who are most at risk of failing.

The following hypotheses were thus formulated:

H_{13}: Parental quality positively influences learning motivation.

H_{14}: Parental quality moderates the negative relationship between environmental unfavourableness and cognitive engagement.

Environmental unfavourableness

In this study, the term "environmental unfavourableness", a situational variable, is defined as low SES, as this is a primary contributor to environmental unfavourableness. Western, McMillan and Durrington (1998) state that SES is a multifaceted construct that refers to three main dimensions, namely occupation, education, and wealth, and found that socio-economic background is the most salient influence on learners in the educational context. The economic prosperity of learners' family, community, and their social background profoundly influence their beliefs, attitudes, expectations, and values regarding education. According to Martin (1994), learners with a low SES participate the least in educational activities. Parents with a higher SES encourage and assist their children more and are more likely to intervene to ensure that principals and teachers fulfil their duties (Timæus, Simelane & Letsoalo, 2013).

The lack of proper learning engagement due to poor socio-economic conditions has been widely researched in South Africa. The impact of household poverty on learners' academic performance was found to be statistically significant in studies by Anderson, Case and Lam (2001), Lam, Ardington and Leibbrandt (2011), and Timæus et al. (2013).

The following hypothesis was formulated:

H_4: Environmental unfavourableness negatively influences cognitive engagement.

Proposed structural model

The proposed structural model was hypothesised to reflect the impact of the selected non-cognitive and situational variables on learning performance. Fourteen research hypotheses were developed after the rationale for each was provided. Our investigation included a focus on whether the relationship between environmental unfavourableness (EU) and cognitive engagement was moderated by the constructs parental quality (PQ), tenacity (TENAC), and resilience (PSYC).

The hypothesised Learning Performance Structural Model is depicted in Figure 1.

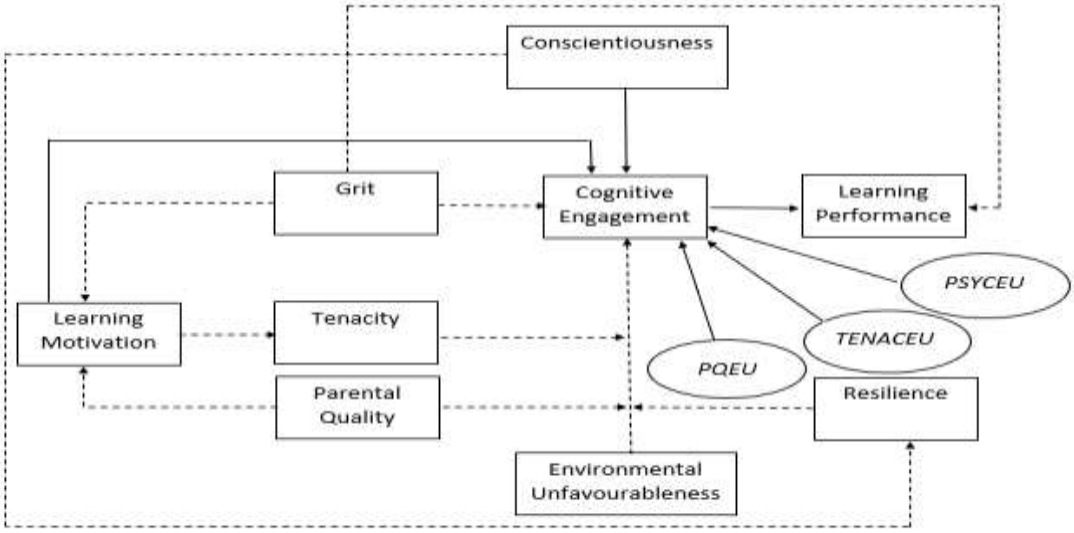

Figure 1 The hypothesised learning performance structural model (Pretorius, 2014)
Note. Interactions between environmental unfavourableness and parental quality (PQEU); tenacity (TENACEU), and resilience (PSYCEU).

Research Design

In this section we provide an overview of the methodology and measurement instruments used in the study.

We decided to use an ex post facto correlation design. Kerlinger and Lee (2000) describe an ex post facto correlation design as a systematic, empirical inquiry by which the researcher does not have direct control over the independent variables.

Sampling and Data Collection

The study population was high-school learners from disadvantaged socio-economic backgrounds in South Africa. Non-probability convenience sampling yielded a sample of 395 respondents, Grade 9 learners (who had completed Terms 1 and 2) from four Western Cape schools in Bonteheuwel, Manenberg, and Goodwood, which are regarded as lower socio-economic areas.

Ethical approval for the study was obtained from the Directorate: Research, Western Cape Department of Education. We also obtained written consent for the learners' participation and to gain access to their academic results from the learners and their caregivers.

Measuring Instruments and Operationalisation

Eight questionnaires were identified through the literature review as providing reliable and valid measures of the latent variables included in the Learning Performance Structural Model. Items were selected (some had to be adapted for the educational context) and combined into a 77-item questionnaire. The instrument applicable to each variable is discussed below.

Cognitive engagement was measured using the Academic Engagement Scale for Grade School Students (AES-GS) (Tinio, 2009). The AES-GS consists of three subscales: behavioural, emotional, and cognitive. In this study we adapted and used only the cognitive subscale with 17 items. Burger (2012) obtained good reliability statistics with a Cronbach alpha of .94.

Conscientiousness was measured using the revised version of the NEO Personality Inventory (NEO-PI-R) and contained 20 of the original 240 items (Costa & McCrae, 1992). For the purposes of this study, we adapted the instrument to the educational setting, while retaining the original definition of the construct, resulting in a 12-item scale. According to Burger (2012), the NEO Five-Factor Inventory (NEO-FFI) correlates strongly with the NEO-PI-R factor score, and the internal consistency estimates are all acceptable.

Learning motivation was measured using the Nunes (2003) omnibus questionnaire, namely the Motivation to Learn Questionnaire (MLQ) to measure learner motivation and intention to learn. The MLQ contains three sections. We used Section B: Motivation to Learn, consisting of six items, assessing motivation to learn the specific programme material presented. The questionnaire has proven to be reliable, in that Nunes (2003) obtained a Cronbach alpha of .94 with a sample size of 114.

Resilience was measured with the Psychological Capital (PsyCap) Questionnaire (six items) (Luthans, Youssef & Avolio, 2007). According to Luthans et al. (2007), the internal consistency and reliability of the PsyCap measures

proved to be consistently above conventional standards.

Grit was measured using the Duckworth et al. (2007) Grit-S, a shortened Grit Scale, consisting of eight items. The internal consistency of the Grit-S was reflected in Cronbach alphas ranging from .73 to .79. The predictive validity of the Grit-S remained at the same level as the original scale (Duckworth et al., 2007). The scale was negatively keyed with a high score indicating a lack of grit. The sign of the observed path coefficients is interpreted in the opposite direction.

Tenacity was measured using an eight-item scale that we developed in conjunction with a knowledgeable reference group to ensure the content validity. Academic tenacity, as operationalised in our study, is defined as working hard and smart over an extended period. The questionnaire utilises a 5-point Likert scale.

PQ was measured using a Parental Quality Scale that we designed to measure the extent to which the learners' caregivers assisted with and reviewed the learners' homework, provided incentives, and had as a goal that their child would complete school. The self-compiled 10-item scale, with response options on a 5-point Likert scale, was evaluated by a group of subject experts to ensure content validity.

EU was measured using a self-compiled 10-item Environmental Unfavourableness (EU) Scale developed in collaboration with a knowledgeable reference group to ensure content validity. The scale was designed to describe a learner's home background, including his or her caregiver's occupational background, degree of physical space at home, and general level of material wealth. The questionnaire utilises a 5-point Likert scale and is negatively keyed with a high score indicating environmental favourableness. The sign of the observed path coefficients is, therefore, interpreted as in the opposite direction.

In the next sections we report on the data analysis and the initial findings.

Results

Where missing data occurred, imputation by means of the *k*-nearest neighbours algorithm (*k*-NN) was used (Altman, 1990).

Item analysis and structural equation modelling (SEM) were used to analyse the questionnaire data and to evaluate the Learning Performance Structural Model, depicted in Figure 1. The so-called soft modelling approach of Partial Least Squares (PLS) was used for this purpose. PLS-SEM is considered useful in prediction-oriented exploratory studies where there are many latent factors with a high likelihood of multicollinearity (Henseler, Ringle & Sinkovics, 2009).

Item Analysis

The Cognitive Engagement (TCE) Scale obtained a Cronbach alpha of .90. Only one item (TCE10) (.34) did not obtain an inter-item correlation greater than .4. According to Pope (2009) inter-item correlations below .2 are considered weak, between .2 and .39 good, and above .4 very good.

The Conscientiousness (CONS) Scale obtained a Cronbach alpha of .84. With an item-total correlation of .02, CONS3 was flagged as a poor item. Another item, CONS4, achieved an item-total correlation of .34. The results indicate that should item CONS3 be removed, the alpha coefficient would rise to .86. However, we decided to, as a matter of principle, retain flagged items in the interest of maintaining the integrity of the test and the latent construct. This strategy is also regarded as important for the comparability of the obtained results with that of other studies.

The Learning Motivation (LM) Scale obtained a Cronbach alpha of .76. The absence of extreme means and small standard deviations indicated the absence of poor items, except for one item (TCE10) that had an item-total correlation of .34.

The Resilience (RES) subscale of The PsyCap Scale obtained a Cronbach alpha of .67. Three of the items, namely PSYCAP1 (.29), PSYCAP 3 (.26) and PSYCAP 5 (.35), had item-total correlations below .4. The removal of PSYCAP1 would lead to an alpha of .68.

The Grit (GRIT) Scale comprises eight items. The scale initially obtained a Cronbach alpha of .62, with only two of the items exceeding an item-total correlation of .4. This unexpected result for the Grit Scale forced us to revisit the construct. The underlying theory indicated that the Grit Scale consisted of two subscales, namely consistency of interest and perseverance of effort (Duckworth & Quinn, 2009). Once this information had been taken into consideration, a Cronbach alpha of .61 was obtained for the subscale "consistency of interest" with no item-total correlation below .30 and two exceeding .40, while a Cronbach alpha of .70 was obtained for the subscale "perseverance of effort", with only GRIT2 (.28) obtaining an item-total correlation below .30.

The PQ Scale obtained a Cronbach alpha of .84. None of the items had an item-total correlation below .4.

The EU Scale obtained a Cronbach alpha of .81. The statistics indicate that item EU5 should be considered a poor item, with an item-total correlation of .1.

The Tenacity (TENAC) Scale obtained a Cronbach alpha of .74. Three items had item-total correlations between .3 and .4., the rest were above .4.

A summary of the results of the item analyses, as well as the composite alpha and average variance

(AVE) extracted by the latent construct is presented in Table 1. The majority of the Cronbach alphas of the scales exceeded the criterion of .70 (Gliem & Gliem, 2003), except for the measures for resilience and grit. According to Tabachnick and Fidell (2013), average inter-item correlations between .15 and .5 could be regarded as acceptable, while Den Hartog, Van Muijen and Koopman (1997) claim that it should be higher than .3. The average inter-item correlations for resilience, grit, and tenacity did not exceed .3.

Table 1 Summary of results of the item analysis, composite alpha and AVE

Scale	Number of items	Cronbach alpha	Average inter-item correlation	Composite alpha	AVE
TCE	17	.90	.34	.91	.38
CONS	12	.84	.32	.87	.38
LM	6	.76	.35	.84	.46
RES	6	.67	.26	.79	.39
GRIT	8	.62	.18	.78	.64
TENAC	8	.74	.27	.82	.36
PQ	10	.84	.35	.87	.41
EU	10	.81	.32	.86	.40

Note. TCE = cognitively engagement; CONS = conscientiousness; LM = learning motivation; RES = PsyCap: resilience subscale, Grit = GRIT, TENAC = tenacity, PQ = parental quality; EU = environmental favourableness.

Evaluating the Outer/Measurement Model

While the Cronbach alphas for RES and GRIT were not completely satisfactory, the composite alphas were all highly satisfactory (Hair, Sarstedt, Ringle & Gudergan, 2018). The AVE indicates that only one variable exceeded the value of .5. The AVE for four variables could be regarded as problematic, although they were mostly marginally under .4. The AVE refers to the amount of variance that the latent construct explains in its indicators. An AVE score below .50 means that more error or chance variance is explained by the indicators than the latent construct (Hair, Hult, Ringle & Sarstedt, 2014).

The hetero-monotrait ratio reflecting the discriminant validity of the scales indicates that they could all be regarded as independent measures (Henseler, Ringle & Sarstedt, 2015). In the case of the outer loadings, all loadings were significant, although the loadings of items CONS3 (.18) and EU5 (.23) were below .4. Riou, Guyon and Falissard (2016) recommend that the outer loading of the latent construct on each indicator should exceed .70. In our study .4 was regarded as problematic.

Evaluating the Inner or Structural Model

Table 2 portrays the nature of the observed path coefficients and whether they were significant of not.

Table 2 Path coefficients of the inner or structural model without the moderators

From	To	Path coefficient	95% lower	95% upper	Significant from Cl	*p*-value from *t*-test
TCE	LP	.16	.05	.27	Yes	< .01
CONS	TCE	.46	.38	.54	Yes	< .01
CONS	RES	.35	.25	.44	Yes	< .01
EU	TCE	-.05	-.11	.02	No	.13
GRIT	TCE	-.17	-.25	-.10	Yes	< .01
GRIT	LM	-.39	-.48	-.31	Yes	< .01
GRIT	LP	-.23	-.34	-.12	Yes	< .01
LM	TCE	.34	.25	.41	Yes	< .01
LM	TENAC	.41	.30	.51	Yes	< .01
PQ	LM	.17	.05	.29	Yes	< .01

Note. LP = learning performance; Cl = confidence level.

The observed path coefficients revealed that cognitive engagement had a significant and positive effect on learning performance (H_1); conscientiousness had a significant and positive effect on cognitive engagement (H_2), and learning motivation had a significant and positive effect on cognitive engagement (H_3). The impact of EU on cognitive engagement was, however, not significant (H_{14}). Learning motivation also had a statistically significant positive effect on tenacity and hypothesis. H_{10} could thus be confirmed (Lucas & Spencer, 2018).

Hypotheses H_6, H_7, H_8 were all confirmed. Grit showed statistically significant effects on learning motivation (H_6), cognitive engagement (H_7) and learning performance (H_8). These findings correspond with the findings of Duckworth et al. (2007) and Dweck et al. (2014).

Regarding H_4; conscientiousness showed a statistically significant positive effect on resilience,

which supports the findings of Oshio et al. (2018) and PQ showed a statistically significant positive effect on learning motivation (H_{12}), which is compatible with the findings of Anderson (2003), Driscoll (2006), and Prinsloo and Theron (2015).

The mediating effect of cognitive engagement on the relationship between grit and learning performance (H_9) was not fully supported as the results seem to indicate limited partial mediation.

In subsequent structural models the moderating effect of tenacity on the relationship between environmental (un)favourableness and cognitive engagement (H_{11}) was confirmed, as well as the moderating effect of PQ on the relationship between environmental (un)favourableness and cognitive engagement (H_{13}). These results were supported by PLS univariate moderation analyses. Further analyses indicate that high scores in both PQ and tenacity strengthened the relationship between environmental (un)favourableness and cognitive engagement.

The R^2 values reported in Table 3 indicate that not all the endogenous latent variables accounted for a meaningful amount of variance. Only a relatively small proportion of the variance in learning performance (12%) is explained by the exogenous variables. Exogenous variables are the independent variables, while endogenous variables are the dependent variables. In contrast, 63% of the variance in cognitive engagement is explained by its exogenous variables. It should be taken into account that the sample consisted of 395 subjects with largely similar circumstances. The lower variance levels may, therefore, be attributable to little variation in the respondents' circumstances.

Table 3 R^2 values for the five endogenous latent variables included in the learning performance structural model

TCE	LM	RES	TENAC	LP
.63	.20	.12	.16	.12

Discussion

We set out to investigate non-cognitive and situational variables that may have a significant negative or positive influence on the learning performance of those learners most affected by the injustices of South Africa's past.

The finding that cognitive engagement and grit had a direct impact on learning performance as the dependent variable, partially supports the work of Prinsloo and Theron (2015), who found, in a similar study with 280 Grade 11 learners, that cognitive engagement, conscientiousness and learning motivation significantly influenced learning performance. In similar vein, Van Heerden and Theron (2014) studied a sample of 320 Grade 12 learners and found that learning motivation influenced learning performance. The relatively weak relationship between cognitive engagement and learning performance and the moderate relationship between grit and learning performance, raised the hypotheses that other non-cognitive factors had an impact on the learning performance of the specific sample group or that the non-cognitive factors had an impact on the learning performance mainly in concert with the cognitive variables.

According to the information gathered, learners who are more driven to learn, will be more persistent in their learning efforts and spend more time actively thinking about the content. This means that they will persevere even when the work is difficult, and their personal circumstances are unfavourable. The results further indicate that greater involvement by caregivers increases learners' motivation to study. The results also indicate that grit enhances learning motivation and cognitive engagement. These findings are supported by the significant impact of conscientiousness on resilience. In our opinion, should the cognitive variables be included in the model, it is likely that clearer underlying dynamics would come to the fore.

We failed to demonstrate that the non-cognitive factors had a strong direct influence on learning performance but demonstrated that the selected variables explained a high proportion of variance (63%) in cognitive engagement, which is regarded as a powerful pivotal variable worthy of inclusion in a structural model combining cognitive and non-cognitive variables.

With this study we investigated the impact of non-cognitive factors on the learning performance of a non-probability group of Grade 9 school-going learners from previously disadvantaged communities in the Cape Town area, Western Cape, South Africa. The survey that we used in the study was compiled from existing and self-developed instruments specifically aimed at the sample of Grade 9 learners. All the self-developed scales had satisfactory internal consistencies, while the use of the scales for resilience and grit should be critically reconsidered in future research.

All the questionnaires were self-report instruments. There are, however, several risks associated with self-report measuring instruments, which include the risk of social desirability, inaccurate self-perception, method bias, and lack of discriminant validity.

The validity of using the composite scores for the four subjects may also be questioned in terms of their reliability and validity as indicators of learning performance.

Another limitation is that the sample of respondents was limited to Grade 9 learners from homogenous communities, possibly limiting variance in the values obtained. Future research could include different age groups, socio-economic backgrounds, geographical regions, and performance levels in different subjects.

It is, however, recommended that the aspects of the proposed model that were empirically supported be integrated into extended structural models pertaining to learning potential and learning performance. Such models would provide greater elucidation of the complex relationships that exist between the cognitive and non-cognitive variables that promote learning performance success.

It is imperative that both teachers and caregivers understand the push and pull forces that have an impact on learners' performance. In future research the strategies for communicating this information and designing platforms for collaboration could be investigated.

Conclusion

It should be noted that almost all the latent variables that were tested in the study were malleable variables; thus, change is possible regarding those variables that most profoundly affect learning performance, and perhaps more specifically, cognitive engagement. The current understanding of the push and pull forces that have an impact on learners' learning success could be used in the development of training material aimed at optimising learners' learning experience and performance. Some of the factors that could be addressed in school are learning motivation, cognitive engagement, grit, tenacity, resilience, and conscientiousness. The factors that are not under the teachers' control, namely PQ, and EU, should be the focus of psychoeducational programmes aimed at the parents.

The use of instructional time to foster cognitive engagement and resilience with respect to the mastery of difficult learning material seems like attractive challenges for teachers. Grit proved to have a significant effect on cognitive engagement and learning motivation. Grit can be promoted by regularly praising learners from an early age for being tenacious and determined to succeed, rather than for good results. It is important that this strategy be consistently executed every year to encourage learners to persist until they successfully complete their final school year, Grade 12.

Finally, in our study we proved that PQ has a significant effect on learning motivation. As this is not under the teacher's control, the importance of this factor should be communicated to parents so that they may become more willing to support their children in completing their studies. Parents should also be informed of the practical ways in which this support can be provided, such as assisting with and checking homework and offering rewards for good grades.

The proposed Learning Performance Structural Model identifies a combination of latent variables that could be considered in enhancing learners' performance. It is hoped that the findings will sensitise teachers to the malleable state-like constructs that interact with the cognitive variables to facilitate learning performance.

In this study we highlighted the role of non-cognitive factors in the learning performance of learners from disadvantaged backgrounds. The current approach to address inequalities in the learning performance outcomes of disadvantaged learners should take cognisance of the non-cognitive factors and actively pursue the facilitation of these abilities or skills in order to facilitate learning performance success.

Authors' Contributions

All authors contributed to the study conception and design. Measurement preparation, data collection and analysis were performed by DP for the purposes of his master's thesis in industrial psychology. The original data were re-analysed for the purposes of this article. DP and his supervisors, JM and MJV, wrote the various versions of the manuscript. All authors read and approved the final manuscript.

Notes

i. This article is based on the master's thesis of Dirk Pretorius.

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