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Hierarchical linear modelling of educational outcomes in secondary schools: What matters – teachers' or administrators' input?

John A. Ekpenyong[1], Valentine J. Owan[2,3]*, Joseph O. Ogar[1] and John A. Undie[1]

Abstract: Research has assessed the diverse characteristics of principals and teachers in analysing students' educational outcomes at various levels. However, these studies often focus on the cognitive domain of learning, ignoring the affective and psychomotor aspects. Bridging this gap, we used hierarchical linear regression to link two inputs of teachers and administrators to students' learning outcomes generally and across the cognitive, affective and psychomotor domains. A total of 1,872 respondents comprising school principals (N = 87), teachers (n = 870), and senior secondary class II (SSII) students (n = 915) from 87 public secondary schools in Calabar Education Zone, Nigeria, participated in the study. Three sets of questionnaires were used for data collection. The questionnaires all had acceptable item and scale content validity indices. Principal Axis Factoring and Confirmatory Factor Analysis were used to assess the dimensionality and acceptability of the established models. Reliability was determined using the Cronbach alpha approach for internal consistency. Results indicated (relatively and cumulatively) that teachers' attitudes to work and social relations significantly predicted students' educational outcomes generally and across the three learning domains. Attitude to work was the strongest predictor of the two teachers' input. Also, administrators' leadership styles and attitudes towards accountability (relatively and jointly) predicted students' learning outcomes holistically and across the three domains significantly. Leadership style was the most substantial administrators' input, trailed by their attitude towards accountability. The study has practical implications for teachers to adjust their work attitudes and social relations and for principals to be accountable and maintain effective leadership practices in schools.

Subjects: Research Methods in Education; Secondary Education; Educational Psychology

Keywords: Accountability; attitude; factor analysis; leadership styles; learning outcomes; social relations; structural equation modelling

1. Introduction

Students' educational outcomes remain an essential aspect of educational evaluation because they revolve around how well learners' capacity has been improved over time. At all levels of education, students' learning outcomes continue to feature as a subject of immense attention and interest among stakeholders, researchers, and practitioners. Over the last decade, much research attention has been paid to different factors affecting students' learning outcomes at the secondary education level. For instance, it has been documented that students' learning outcome is

affected by factors such as parental involvement (Castro et al., 2015; Otani, 2019; Tazouti & Jarlégan, 2019), methods of teaching (Robert & Owan, 2019; Wilder, 2015), parents' socioeconomic status (Lee, 2022), teachers' use of instructional materials (Ihejiamaizu & Ochui, 2019; Owan, Agurokpon et al., 2022) and principals' leadership techniques (Cornelissen & Smith, 2022; Jang & Alexander, 2022; Owan & Agunwa, 2019; Owan, Asuquo et al., 2022).

Others have attributed students' achievement in different subjects to variables such as procrastination (Batool, 2020), self-discipline (Achtziger & Bayer, 2020; Spohrer, 2021), student demographic variables (Lei et al., 2021; Mavilidi et al., 2021; Watson et al., 2021), learning environment (Guo et al., 2021; Lerang et al., 2019; Wan & Cheng, 2019), students' proficiency and anxiety (Estrada et al., 2020; Stoffelsma & Spooren, 2019). These factors can be grouped broadly into teacher-, student-, administrator- and environment-related factors. Most of the literature has extensively been on student-related factors since they directly affect their achievement. Nevertheless, studies on teachers' characteristics and students' learning outcomes have also gained traction (e.g., Adedigba & Sulaiman, 2020; Oludipe & Oludipe, 2021). These studies are often too centred on teachers' personality traits rather than teachers' input while discharging services. In the present study, we argue that the school administrators and teachers are critical personnel that can determine how well students learn and what comes after (their learning outcomes). Thus, we investigated how some teachers' and administrators' inputs predict students' educational outcomes. We used the term educational outcomes for inclusiveness by shifting focus to cover the cognitive, affective and psychomotor skills. Previous studies have often measured learning outcomes from the cognitive perspective, ignoring the affective and psychomotor components.

2. Literature review

2.0.1. Studies on teachers' input

Teachers' inputs in the education production process are the factors that determine their abilities to deliver their roles in the system. These inputs include educational qualifications, years of experience, salary level, attitude to work and social capital. These inputs are also called teachers' characteristics (Espinosa, 2017; Kosgei et al., 2013). Teachers' inputs play significant roles in the education production process and thus tend to determine to a large extent how educational goals are attained in a school system. Fehintola (2014) indicated that teachers' contribution is the most crucial factor regarding any educational system's performance and quality. Educational facilities cannot enhance students' academic achievement unless instructors show appropriate use behaviours. According to Kosgei et al. (2013), teachers must possess and use particular qualities and attributes to impact their students' academic success.

Empirically, studies have examined different inputs of teachers concerning students' learning outcomes. For example, it has been shown that persons eligible to teach must have completed at least a bachelor's degree, focusing on education as a career path (Aina & Sunday, 2015; Kosgei et al., 2013). Stereotypic explanations for students' performance and involvement in the classroom might be generated by instructors' unconscious gender prejudices, according to Awodun et al. (2015). Similarly, research has shown that the longer time someone spends working in a specific field, the more informed and experienced they become in that field (Onyekuru & Ibegbunam, 2013). In the education context, it has similarly been shown that schools with a higher percentage of instructors with more than ten years of teaching experience had better performance than schools having more teachers with ten years or less of teaching experience (Ewetan & Ewetan, 2015).

As Ntawiha (2016) has demonstrated, exogenous factors such as teacher education, training and experience, and the number of students in a class are essential determinants of student success. This implies that teachers' qualifications, among other things, contribute to variations in educational outcomes in the studied schools, though the emphasis was only on the students' cognitive skills. In another study, Fehintola (2014) discovered that 54.6 per cent of the variation in

student academic performance was accounted for by teachers' academic qualifications and professional credentials, topic understanding, instructional quality, assessment methods, work value, classroom attendance, and job satisfaction.

Other studies have pointed to teachers' attitudes as a significant predictor of students' academic performance (Ekperi et al., 2019), personality and life performances (Adesina et al., 2016). These researchers have established that teachers' attitude to work contributes to cognitive and affective aspects of educational outcomes. The interpersonal relationship teachers have with students, and their parents affect instructional settings in a school and thus affects students learning (Kaptich et al., 2019). Furthermore, researchers (Paschal & Mkulu, 2020) found that positive teacher-student connections bolster student well-being and promote student autonomy and participation in class, contributing to better grades and increased student engagement. This means that teachers' social relations affect education production in schools.

2.0.2. Studies on administrators' input

Administrators' inputs are their personal, professional and leadership attributes used in the education production process to deliver quality students. These attributes range from their qualifications, years of experience, leadership style and attitude towards accountability. Much responsibility comes with being a school administrator. Therefore, they must have the proper education, experience, and drive to succeed in their position (Murtiningsih et al., 2019). School heads are expected to possess adequate supervisory knowledge, skills and attitude through training and experiences to discharge their instructional duties for effective teaching and learning (Kipngeno, 2014). Principals' primary responsibility is to improve the educational experience for all students, and this can only be done with the right mix of personal, organisational, and corporate skills (Sezerii, 2018).

In addition to building reliable connections, successful high school administrators are noted for choosing and developing individuals inside the organisation and reaching out to those using available resources to increase academic accomplishment for all (Wilkey, 2013). The systematic review of Osborne-Lampkin et al. (2015) showed various correlations between principal characteristics, including their educational qualifications and student achievement. According to Muthoka et al. (2018), poor scores in national exams in many secondary schools may be traced to school principals' administrative expertise and managerial efficacy. The researchers noted that principals headed many secondary schools with few years of administrative experience. Consequently, Obam et al. (2016) found that most school administrators could not provide a conducive learning environment and rarely assisted instructors in helping students accomplish their academic goals.

According to other studies, teachers' job performance and student academic achievement are strongly linked to the leadership styles of principals (Arop et al., 2020; Igwe et al., 2017; Muthiani, 2019; Owan et al., 2020). On the contrary, the study by Garland (2018) found no link between principal leadership style and English/Reading or maths test scores. As a result of their excellent visibility, principals were shown to significantly impact student arithmetic success (as measured by standardised test scores). While principals' leadership negatively influenced students' academic performance in terms of strategic direction and policy environment practices, it had a favourable impact on the growth and development of teachers and leaders. Garland's study further indicated that when school shareholders put pressure on schools to improve academic performance, it boosted support for market accountability policies, but when bureaucrats put pressure on schools to do the same, it weakened support.

It can be said that several gaps exist that warrant that the present study is conducted having explored existing literature on students' educational outcomes in the context of teachers' and administrators' inputs. First, the bulk of the cited studies used poorly validated instruments for data collection. This creates doubt in their results regarding the validity of the tools used for gathering data. The present study addresses this gap by following acceptable practices in

developing and refining instruments with good psychometric properties for data collection. Secondly, most cited studies measured educational outcomes, academic performance, or learning outcomes from only the cognitive domain. It is unarguable that schools are saddled with the primary duty of modifying learners' affective, cognitive, and psychomotor attributes. Therefore, a sound output or outcome assessment should focus on these three domains. For this reason, some scholars have faulted the cognitive-based evaluation system as being unreliable due to its provision of misleading results (Bassey et al., 2019). The current study bridges this gap by shifting focus to cover the three learning domains for a rich and more inclusive result.

Lastly, the current study used a hierarchical linear regression modelling approach to link two inputs each of teachers (social relations and attitude to work) and administrators (leadership style and attitude towards accountability) to students' educational outcomes generally and in terms of Cognitive, Affective and Psychomotor skills (hereafter, CAPs). This seems to be the first study using this approach to establish linkages between teachers' and administrators' inputs and students' educational outcomes. However, other scholars have used the approach in the field of education to examine "pre-service teachers' career values as determinants of career choice satisfaction" (An et al., 2021). It has also been used to identify "significant predictors of student evaluations of faculty" (Radmacher & Martin, 2001) and discover "what makes a teacher better" (Ereño & Nunez, 2014). Others have also used it to examine "individual demographic and school support factors regarding teachers' intention to use technology" (Huang et al., 2021). Based on the studies reviewed and the identified gaps, the conceptual model of this study was developed, as shown in Figure 1.

As shown in Figure 2, the lines with arrow heads in the model indicate predictive links, whereas non-arrow lines indicate dimensions. As shown in the model, the core predictors of this study are teachers' and administrators' input. However, the study considered teachers' input (attitude to work and social relations) and administrators' input (leadership style and attitude towards accountability). The central criterion variable is educational outcomes, with three dimensions—cognitive, affective and psychomotor outcomes. The model (Figure 3) shows our hypotheses that teachers' attitudes and social relations predict students' educational outcomes generally and in the dimensions of cognitive, affective and psychomotor outcomes. Similarly, leadership style and attitude towards accountability predict students' educational outcomes generally and across the three dimensions

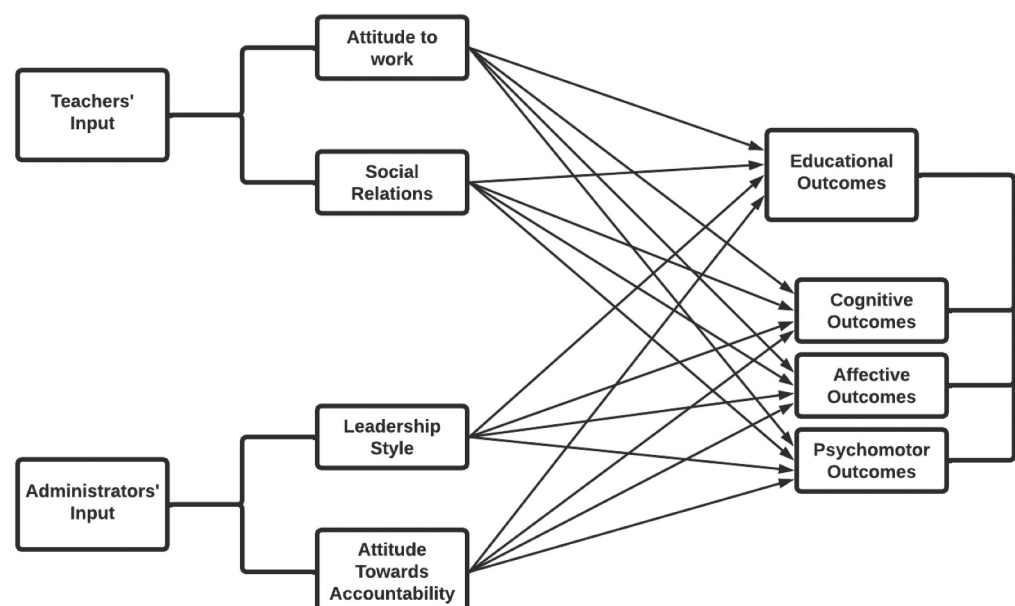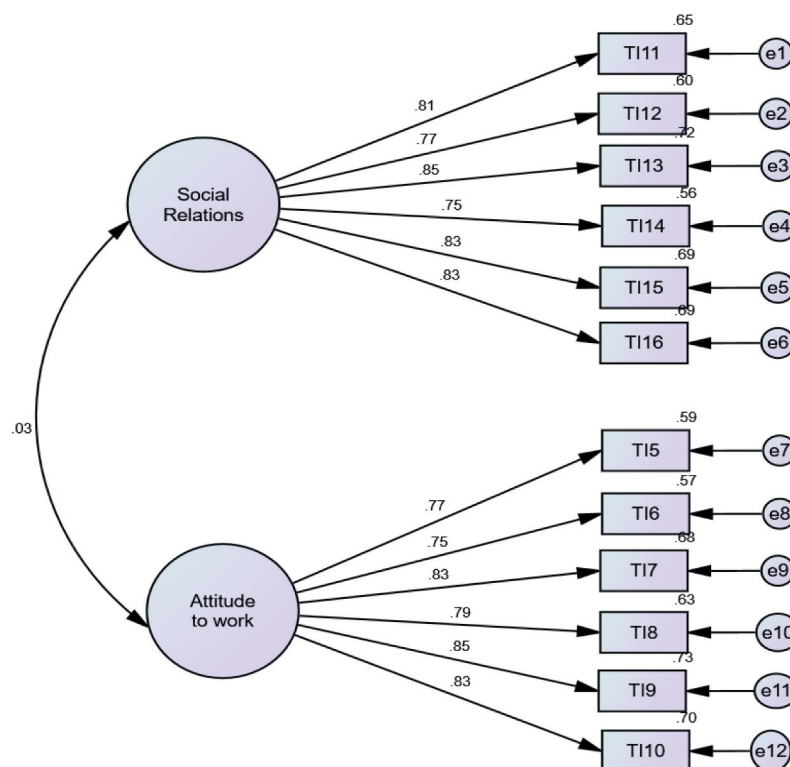**Figure 1. Conceptual mode showing the framework of this study**

Figure 2. Standardised Latent-Trait CFA Model of the TIQ

3. Purpose of the study

This study investigated the predictive relationship of teachers' and administrators' inputs to students' educational outcomes in public secondary schools. Specifically, the study assessed:

(1) the relative and composite contributions of teachers' inputs (attitude to work and social relations) to educational outcomes generally and in terms of the cognitive, affective, and psychomotor domains;

(2) the relative and composite contributions of administrators' inputs (leadership style and attitude towards accountability) to educational outcomes generally and in terms of cognitive, affective, and psychomotor domains in public secondary schools.

4. Research questions

Based on the specific purpose of this study, answers were provided to the following research questions:

(1) What are the relative and composite contributions of teachers' inputs (attitude to work and social relations) to educational outcomes generally and in terms of the cognitive, affective, and psychomotor domains in public secondary schools?

(2) What are the relative and composite contributions of administrators' inputs (leadership style and attitude towards accountability) to educational outcomes generally and specifically in terms of cognitive, affective, and psychomotor domains in public secondary schools?

5. Methods

5.1. Design and participants

The correlational research design under the quantitative research method was adopted. The correlational designs allow for relationships among variables to be established. A total of 1,872 participants were recruited for the study through the multistage sampling procedure. We followed the multistage

random sampling procedure in enumerating the respondents for this study. First, we used stratified random sampling to split the whole Calabar Education Zone into seven strata. Each stratum represented a local education authority (LEA) such as Akamkpa, Akpabuyo, Bakassi, Biase, Calabar-Municipality, Calabar-South and Odukpani. Second, at each LEA, 30 per cent of the schools were randomly selected to participate in the research. Lastly, we randomly chose 100% of administrators, 20% of teachers and 15% of students at the schools earlier selected in stage 2. Thus, a random selection of school principals (N = 87), teachers (n = 870) and senior secondary class II (SSII) students (n = 915) from 87 public secondary schools in the Calabar Education Zone of Cross River State, Nigeria.

5.2. Measures and instrument

This study involved three primary measures: teachers' input, administrators' input, and educational outcomes. However, there are four predictors—two for teachers' and administrators' inputs. These are attitude to work and social relations (teachers' input), leadership style and attitude towards accountability (principals' input). There is one criterion variable—educational outcomes, with cognitive, affective and psychomotor dimensions revealed through exploratory factor analysis. This study has no control, moderating or mediating variable to provide a baseline for the links between the predictor and criterion variables. Following this is the operational definition of the primary measures of this study.

Teachers' inputs in the education production process refer to factors determining their ability to deliver their roles in the education system. These inputs include their educational qualifications, years of experience, salary level, attitude to work, social capital and gender (Jita, 2013; Kosgei et al., 2013). In this study, the focus was on teachers' attitudes to work and their social relations. These two were considered because they have received less attention in the literature. The next measure is administrators' inputs, defined as principals' personal, professional and administrative attributes that affect the quality of their service delivery, such as educational qualifications, years of experience, leadership style, attitude towards accountability and their gender (Owan et al., 2020; Reddy et al., 2021). This study focused on principals' leadership styles and attitudes toward accountability. These two variables were considered because the attitude towards accountability is rarely discussed in the literature, whereas leadership is the soul of school management. The third measure considered in this study is educational outcomes, defined as how learners have achieved their short- and long-term educational goals across the cognitive, affective and psychomotor facets. It goes beyond mere achievement in an examination or test to include the production of the total man with the right intellect, attitudes and skills to function in a dynamic society (Bassey et al., 2019). The three learning domains were considered to bridge the short-comings of previous studies and obtain a more inclusive result.

Three instruments were used for data collection—the Teachers' Inputs Questionnaire (TIQ), Administrators' Input Questionnaire (AIQ) and Educational Outcomes Questionnaire (EOQ). The researchers designed these instruments using information from an extensive review of related literature. We saw a need to develop and validate the instruments due to the unavailability of previously developed instruments, especially in the study's context. The educational outcomes Questionnaire (EOQ) was designed to measure students' affective and psychomotor skills, while students' cognitive skill was measured based on average scores from their sessional results. The TIQ (four points scale) had 16 items, AIQ (four points scale) comprised 15 items, whereas the EOQ (six points scale) contained 30 items.

5.3. Validity and reliability of the instruments

Ten experts (four psychometrists and six economics of education experts) validated the research instruments to produce the Content Validity Index (CVI). It was necessary to assess whether the items were relevant and clear for the measured domains. For each question, relevance and clarity were rated on a scale ranging from one to four, with a higher score indicating more relevance and clarity of the item. However, the Item Content Validity Index (I-CVI) realised for TIQ ranged from .80 to .99 and .90 to .99 for relevance and clarity, whereas the Scale Content Validity Index (S-CVI) was 0.98 (for relevance) and 0.98 (for clarity). For AIQ, I-CVIs ranged from .91 to .99 (for relevance) and .92 to .99 (for clarity), whereas the S-CVI was .99 (for relevance) and .98 (for clarity). For EOQ, I-CVIs ranged from .90 to .99 (for relevance) and .84 to .99 (for clarity), while the S-CVI was .99 (for relevance) and .98 (for clarity). The S-CVIs for the

three instruments are based on the average proportion of experts' rating (Hadi et al., 2020; Lawshe, 1975). However, based on the proportion of universal agreement (Zamanzadeh et al., 2015), S-CVI for TIQ and AIQ was .92 (for relevance) and .83 (for clarity), respectively. Whereas for the EOQ, S-CVI based on the universal agreement approach was .94 (for relevance) and .89 (for clarity). Other scholars have offered the standards for revising, dropping, and retaining an item based on the number of independent assessors. When nine to ten experts are used (as in this study), at least an I-CVI or S-CVI value of .78 or higher is required to retain an item, whereas values between .60 to .77 require revisions (Davis, 1992; Polit et al., 2007; Yusoff, 2019). All the items were retained since all I-CVIs and S-CVIs are within the range of .80 and .99.

Furthermore, the research instruments were further subjected to Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) for construct validity. We conducted a pilot study to evaluate the dimensionality and factorial structure of the instruments used to gather data. For the pilot study, 110 school leaders, 233 teachers, and 412 students were randomly selected from non-participating schools in the research area. Box plots and inter-item correlations were used to screen the data for outliers and check for normality and non-clustered items. These tests were performed as preliminary assessment requirements in line with the recommendations of instrument validation studies (e.g., Bassey et al., 2020; Field, 2005; Owan et al., 2021). The preliminary screening test did not uncover non-clustered items across all instruments due to the matrix's ability to correlate unique items with others. Using Principal Axis Factoring (PAF) and based on Eigenvalues greater than 1, the EFA was conducted to reveal the number of underlying factors/dimensions. . Additional attempts were to reduce factor loadings below .30 using the promax rotation. To aid in the analysis, SPSS version 25 progra was used. The result of the EFA and CFA are presented in the results section, along with Cronbach alpha reliability estimates.

5.4. Ethical considerations

To avoid potential bias in our study, we used a complete validity and regulatory approach to collect our data. Ethical clearance did not apply to this study as per national guidelines and regulations. The Nigerian Code for Health Research Ethics (NCHRE) exempts survey research from receiving ethical clearance since it poses no major risk to participants filling out a questionnaire (see https://bit.ly/3pK9ORh). Since all participants signed a document verifying that they were aware of the study and ready to participate, we were able to get written informed consent from them. Respondents were assured of their privacy by informing them that the information they provided would be de-identified and anonymised, following safe harbour guidelines. For security and privacy, respondents were informed that their responses would be anonymised before collating. We ensured that no one's identity could be deduced from aggregated biodata (such as age, gender, educational qualification, years of experience and so on). The encoded information was kept on computers accessible only to the researchers and protected with a security system (strong password, antivirus software, and a firewall) to prevent unauthorised access to the collected data. We informed participants that their replies would be aggregated and published in a peer-reviewed journal.

5.5. Procedure for data collection

We physically administered copies of the instrument to the targeted respondents through the support of six research assistants recruited for data collection. The instruments were administered to 87 administrators, 870 instructors and 915 SSII students. All the participants of this study took part voluntarily, and respondents were free to quit the exercise at anypoint. Teachers responded to TIQ, principals responded to AIQ, and students responded to the EOQ. We recovered completed copies of the questionnaire from all the principals (n = 270) and teachers (n = 870). However, we could not recover 45 copies of the questionnaire from the students. The unrecovered copies account for approximately 5% of the administered copies. All the recovered copies were filled correctly; there was no missing data. Hierarchical regression analysis was used for data analysis.

5.6. Models' specification

The hierarchical models of this study were specified as follows:

Model 1: EO = β_{AW} + e (R^2) $\hspace{2cm}$ (1)

Model 2: EO = β_{AW} + β_{SR} + e (R^2, ΔR^2) $\hspace{2cm}$ (2)

Model 1: CS = β_{AW} + e (R^2) $\hspace{2cm}$ (3)

Model 2: CS = β_{AW} + β_{SR} + e (R^2, ΔR^2) $\hspace{2cm}$ (4)

Model 1: AS = β_{AW} + e (R^2) $\hspace{2cm}$ (5)

Model 2: AS = β_{AW} + β_{SR} + e (R^2, ΔR^2) $\hspace{2cm}$ (6)

Model 1: PS = β_{TAW} + e (R^2) $\hspace{2cm}$ (7)

Model 2: PS = β_{TAW} + β_{TSR} + e (R^2, ΔR^2) $\hspace{2cm}$ (8)

Model 1: EO = β_{LS} + e (R^2) $\hspace{2cm}$ (9)

Model 2: EO = β_{LS} + β_{ATA} + e (R^2, ΔR^2) $\hspace{2cm}$ (10)

Model 1: CS = β_{LS} + e (R^2) $\hspace{2cm}$ (11)

Model 2: CS = β_{LS} + β_{ATA} + e (R^2, ΔR^2) $\hspace{2cm}$ (12)

Model 1: AS = β_{LS} + e (R^2) $\hspace{2cm}$ (13)

Model 2: AS = β_{LS} + β_{ATA} + e (R^2, ΔR^2) $\hspace{2cm}$ (14)

Model 1: PS = β_{LS} + e (R^2) $\hspace{2cm}$ (15)

Model 2: PS = β_{LS} + β_{ATA} + e (R^2, ΔR^2) (16)

Note: from equations 1 to 16 EO = Educational outcomes generally, CS = Cognitive skills

AS = Affective skills, PS = Psychomotor skills, AW = Attitude to work; SR = Social relations; LS = Leadership style, ATA = Attitude towards accountability; R^2 = Coefficient of determination obtained from the regression analysis; ΔR^2 = The change in the coefficient of determination occurring as new variables are introduced in succession to preceding models; e = the stochastic error term.

6. Results

6.1. Exploratory factor analysis (EFA)
The exploratory factor analysis of the TIQ was performed based on the data collected from 233 teachers in the pilot sample. After preliminary screening using the inter-item correlation matrix, it was found that all items correlated with one or more other items in the matrix. The correlation determinant value of .000 was less than the criterion matrix value of .00001, indicating an absence of multicollinearity among the items. This implies that items maintained unique contributions, even those measuring the same latent trait. The result revealed a KMO value of .90, which indicates that the sample of 233 teachers used to respond to items was large enough for factor analysis to be performed on the data. At 66 degrees of freedom, Bartlett's sphericity test yielded a significant Chi-square value of 1842.69. This indicates no duplication in the data and that the observed correlation matrix is distinct from the identity matrix, allowing for a dimension reduction approach such as PAF (Owan et al., 2021). The PAF analysis revealed a two-factor structure in the instrument, contributing 65.34% to the variance explained. These two factors

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were the only ones that had Eigenvalues greater than 1. All the items loaded highly (from .75 to .85) and uniquely onto these two factors (see, Table 1).

For the AIQ, the correlation matrix determinant value of .001 was greater than the identity matrix criterion value of .00001. The KMO value of .86, as well as Bartlett's test of sphericity index of 767.25 at 66 degrees of freedom (p < .05), all indicated that the sample of 110 principals who participated in the pilot study was large enough for the data obtained to be subjected to factor analysis. The PAF revealed a 2-factor solution which accounted for 57.76% of the total variance explained by the factors. The Scree plot was also used to examine the factors, where it was also found that two factors had Eigenvalues greater than 1. The pattern and factor matrices were all examined for the loadings of the respective factors unto their targeted construct. There were no cross-loadings, and all items loaded uniquely above .50 to their factors (See, Table 2).

The determinant value (.000) was found in the inter-item correlation matrix for the EOQ, which differs from the identity matrix of .00001. The inter-item correlation analysis identified three ineffective items (EO4, EO9 and EO11). No other component in the matrix correlated with these three, not even with each other. They were left out of the EFA analysis because of their solitary position among the other components. There was a statistical significance in Bartlett's test of sphericity, $\chi^2(105) = 3693.38$, p < .05; for the sample adequacy, a KMO value of .94 was obtained. These results showed that the PAF was a realistic option based on the data collected from the pilot sample of 412 students. Two factors were found, which accounted for 54.21 per cent of the variation in the results. There were also two components with Eigenvalues larger than 1 in the scree plot (See, Table 3).

6.2. Confirmatory factor analysis (CFA)

The CFA was carried out using the Maximum Likelihood (ML) estimation approach. Amos v.23 was used to do the statistical analysis. As stated by Owan et al. (2021), the CFA assess[es] whether hypothesised

Figure. 3. Standardised Latent-Trait CFA Model of the AIQ
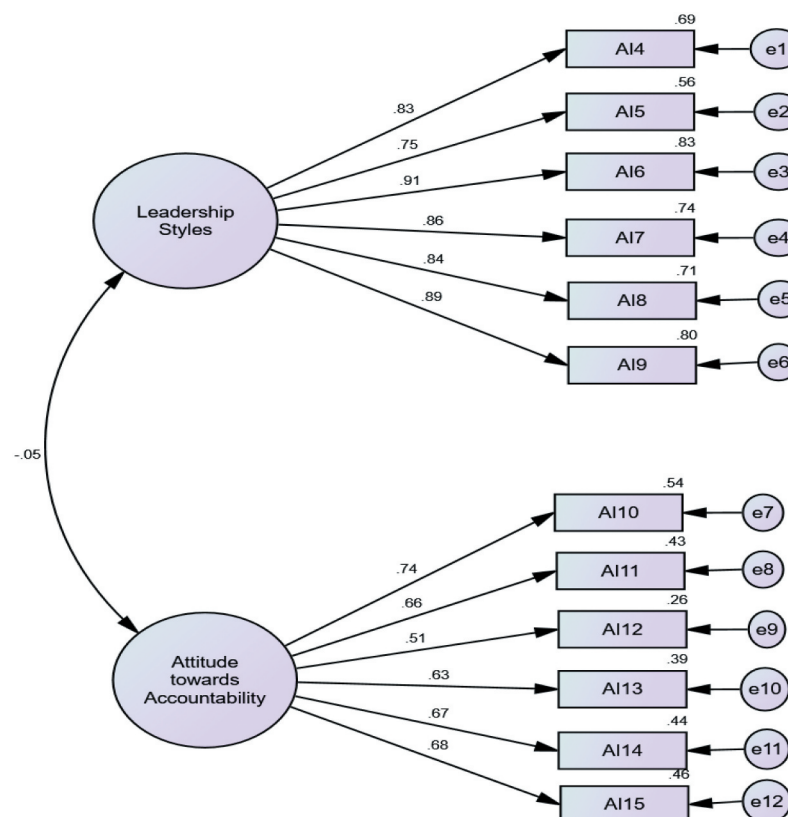
models based on theoretical models are acceptable or not (p. 11). The CFA was performed on the three instruments used in this research to see how well they could measure the latent components they were designed to measure. Figures 2 to 4 show that the CFA loadings per construct were almost identical to those of the EFA. The fit of the created CFA models to their existing theoretical models was tested using several fit indices. . Several fit indices were used because Kline (2005) advised using at least four fit indices ($\chi2$, RMSEA, CFI, and SRMR) to evaluate a CFA model. The Chi-Square, GFI ("Goodness of Fit Index"), NFI ("Normed Fit Index"), RFI ("Relative Fit Index"), IFI ("Incremental Fit Index"), TLI ("Tucker-Lewis Index"), CFI ("Comparative Index"), RMSEA ("Root Mean Square Error of Approximation") and HOELTER's Critical N were employed in this work. The Chi-square index measures the degree of difference and its fitted covariance matrix (Cornell Statistical Consulting Unit, CSCU, 2021). According to Gatignon (2010), one weakness of the Chi-squared test of model fit is that researchers may overlook an inappropriate model while rejecting a good model with large sample numbers.

The GFI is used to explain "the percentage of variance accounted for by the estimated population covariance"; with cut-off values of 0.95, it is used to explain "the proportion of variance accounted for by the estimated population covariance" (CSCU, 2021; p. 1). The NFI, RFI, IFI, CFI, and TLI measure how well an estimated model fits compared to the theoretical or null model

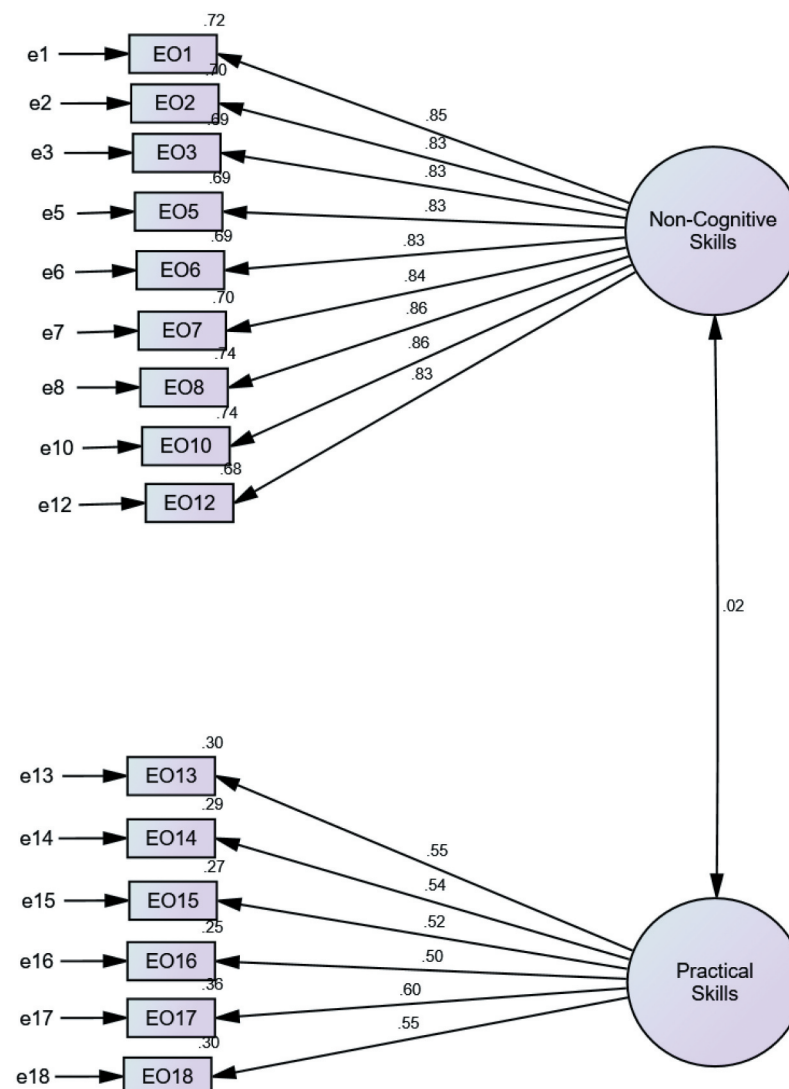**Figure 4. Standardised Latent-Trait CFA Model of the EOQ**

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Table 1. Exploratory Factor Analysis of the structure of the TIQ					
Factors	**Items**	**M**	**SD**	**λ**	
				EFA	**CFA**
Social relations (Variance explained: 33.56%; Cronbach Alpha reliability: .92)	TI13—I am very strict when dealing with students	2.38	1.13	.84	.85
	TI16—I make friends with all students in the classroom	2.42	1.13	.83	.83
	TI15—I do not always entertain parents' complaints	2.37	1.16	.83	.83
	TI11—I rarely relate with students to avoid being insulted.	2.30	1.11	.82	.81
	TI12—I relate well with other teachers in my school	2.37	1.12	.77	.77
	TI14—I am interested in students with intelligent students	2.39	1.16	.75	.75
Attitude to work (Variance explained: 31.80%; Cronbach Alpha reliability: .92)	TI9—I give students notes once a week	2.46	1.11	.85	.85
	TI10—Sometimes, class prefects copy my notes for others	2.45	1.14	.83	.83
	TI7—I find it stressful to mark students' assignments on time	2.52	1.12	.83	.83
	TI8—I feel reluctant to submit lesson plans for vetting	2.48	1.17	.79	.79
	TI5—Going to work early is very stressful for me	2.39	1.15	.77	.77
	TI6—I rarely use instructional materials for teaching	2.55	1.14	.75	.75

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

d. Rotation converged in 3 iterations.

Table 2. Exploratory Factor Analysis of the structure of the AIQ					
Factors	**Items**	**M**	**SD**	**λ**	
				EFA	**CFA**
Leadership style (Variance explained: 36.41%; Cronbach Alpha reliability: .94)	AI6—For me, the management of the school is a collective responsibility	2.60	1.13	.90	.91
	AI9—I consistently demonstrate to staff how I want them to carry out their duties	2.54	1.11	.89	.89
	AI7—Involving all stakeholders in administrative issues is not a good leadership practice in school	2.59	1.14	.85	.86
	AI8—I allow staff freedom to make personal decisions about their work	2.42	1.12	.85	.84
	AI4—I make all the decisions without allowing the participation of anyone in the school	2.56	1.13	.84	.83
	AI5—I feel that staff have the required competencies to perform assigned duties without any supervision	2.53	1.14	.76	.75
Attitude towards accountability (Variance explained: 21.35%; Cronbach Alpha reliability: .81)	AI10—I rarely share school finance information with stakeholders	2.65	1.06	.73	.74
	AI14—I provide accounting records in every PTA meeting	2.45	1.08	.68	.67
	AI11—I give the financial report of my school once a term	2.57	1.10	.67	.66
	AI15—I make all expenditures from imprest known to all staff	2.63	1.13	.66	.68
	AI13—I do not include internally generated funds in the school budget to elicit stakeholders' financial support	2.47	1.08	.64	.63
	AI12—I do not discuss financial issues during staff meetings to avoid too many arguments	2.61	1.10	.52	.51
Instrument Total	Kaiser-Meyer-Olkin (KMO) = .86; Bartlett's Test of Sphericity at 66 df = 767.25, p < .05; Cronbach Alpha = .80; Corr. Det. Matrix = .001				

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

b. Rotation converged in 3 iterations.

(Owan et al., 2021). These statistics range from .00 to 1.00, with values closer to 1.00 suggesting a better fit (Hooper et al., 2008). Initially, a cutoff criterion of 0.90 was recommended; however, a value larger than 0.90 is currently advocated to guarantee that incorrectly stated models are not chosen. These indices (TLI and CFI) are utilised in all SEM programs and are among the most often referenced fit indices since they are the metrics least impacted by sample size (Fan et al., 1999).

The RMSEA indicates how well a model fits the population's covariance matrix (Bassey et al., 2019b). Values of this statistic vary between 0 and 1, with lower values suggesting a better model fit (Hu & Bentler, 1999). Brown (2015) states that an RMSEA score of .06 or less indicates a good model fit. The model fits shown in Table 4 were assessed using these criteria and thresholds. Except for the Chi-Square and GFI criteria, the TIQ model did well by fulfilling all other requirements. Except for the Chi-Square condition, the EOQ satisfied practically all the criteria. Thus, the two models (TIQ and EOQ) were retained. The NFI, IFI, TLI, CFI, and RMSEA requirements were fulfilled by the AIQ model. However, the Chi-Square, GFI, and RFI criteria were not met. The AIQ model, on the other hand, was kept since it satisfied most of the requirements but barely missed a few.

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Table 3. Exploratory Factor Analysis of the structure of the EOQ					
Factors	**Items**		**SD**	**λ**	
				EFA	**CFA**
Affective skills (Variance explained: 42.35%; Cronbach Alpha reliability: .90)	EO10—I am always ready to solve the problem of other students	3.46	1.70	.86	.858
	EO8—Sometimes, I doubt my ability to do something well	3.48	1.69	.86	.86
	EO1—I have regard for the views of others	3.51	1.66	.85	.85
	EO7—Sometimes, I suffer from an inferiority complex	3.37	1.66	.84	.84
	EO3—I keep school rules and regulations	3.56	1.69	.83	.83
	EO2—I give respect to teachers who deserve it	3.48	1.71	.83	.83
	EO6—I always want to lead other people	3.53	1.72	.83	.83
	EO12—I like to study independently	3.47	1.71	.83	.83
	EO5—I think good about myself always	3.43	1.70	.83	.83
Psychomotor skills (Variance explained: 11.86%; Cronbach Alpha reliability: .71)	EO17—I have the skills to handle practical exercises	3.45	1.66	.60	.60
	EO13—I can operate the computer effectively	3.43	1.74	.54	.55
	EO14—I can carry out laboratory experiments independently	3.42	1.70	.54	.54
	EO18—I am very effective in craftwork	3.31	1.69	.54	.55
	EO15—I have adequate skills to handle agricultural activities on the school farm	3.40	1.72	.52	.52
	EO16—I can manipulate mechanised instructional materials in school.	3.27	1.65	.50	.50
Instrument Total	Kaiser-Meyer-Olkin (KMO) = .94; Bartlett's Test of Sphericity at 105 df = 3693.38, p < .05; Cronbach Alpha = .83; Corr. Det. Matrix = .000				

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

Rotation converged in 3 iterations.

Table 4. Fit summary statistic illustrating the indications of the overall CFA model fit for the instruments used to gather data in the main research								
Model	**Chi-Square (χ^2)**	**GFI**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**
TIQ	94.19, df = 53, p < .001	.94	.95	.94	.98	.97	.98	.06
AIQ	78.79, df = 53, p < .05	.90	.90	.88	.97	.96	.97	.07
EOQ	167.80, df = 89, p = .00	.95	.96	.95	.98	.97	.98	.05

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Table 5. Hierarchical regression results of the relative and composite contributions of teachers' inputs to educational outcomes

Variables	Model	R	R^2	Adj. R^2	SE	ΔR^2	ΔF	df1	df2
Educational outcomes generally	1	.33[a]	.11	.11	194.12	.11	104.19***	1	868
	2	.37[b]	.14	.14	190.99	.03	29.70***	1	867
Cognitive skills	1	.33[a]	.11	.11	186.24	.11	103.19***	1	868
	2	.37[b]	.14	.13	183.38	.03	28.33***	1	867
Affective skills	1	.35[a]	.12	.12	5.09	.12	123.19***	1	868
	2	.43[b]	.19	.18	4.91	.06	66.12***	1	867
Psychomotor skills	1	.35[a]	.12	.12	3.00	.12	119.75***	1	868
	2	.43[b]	.19	.19	2.89	.07	70.18***	1	867

a Predictors: (Constant), Teachers' attitude to work

b Predictors: (Constant), Teachers' attitude to work, Teachers' social relations

*** $p < .001R$

6.3. Research question 1

What are the relative and composite contributions of teachers' inputs to educational outcomes generally and specifically in terms of cognitive, affective, and psychomotor skills in public secondary schools? In this research question, the independent variable is teachers' input (teachers' attitude to work and social relations). The dependent variable is educational outcomes. The dependent variable was treated generally and specifically in terms of CAPs. All the variables of this research question are continuous, based on data and measurement. Hierarchical linear regression analysis (presented in Table 5) was used to provide an answer to the research question.

Table 5 shows that the first teachers' input (teachers' attitude to work) predicts educational outcomes generally by 11% in secondary school in model 1. The inclusion of teachers' social relations (as the second teachers' input) in model 2 increased the contribution of teachers' inputs from 11% to 14%, resulting in a 3% increase. This implies that teachers' inputs, such as teachers' attitude to work and social relations, contribute 11% and 3% to educational outcomes, respectively. Furthermore, Table 5 shows that teachers' inputs generally account for 14% of the total variance in educational outcomes, with the remaining 86% attributed to variables outside of model 2. According to Table 5, the teachers' input that has the most decisive impact on educational outcomes is teachers' attitude to work, followed by teachers' social relations.

In terms of cognitive skills, Table 5 indicates that the initial teachers' input (teachers' attitude to work) contributes 11% to model 1. In model 2, the addition of teachers' social relations resulted in a change of 3%, increasing the contribution of teachers' inputs in model 2 from 11% to 14%. This means that teachers' inputs, such as teachers' attitudes to work and social relations, could be held accountable for 11% and 3% of the total variance in educational outcomes regarding cognitive skills. In a composite sense, teachers' input is responsible for 14% of the total variation in educational outcomes regarding cognitive skills, with the remaining 86% of the unexplained variance possibly due to other variables not enlisted in the model. According to Table 5, teachers' attitudes to work significantly impacted educational outcomes in cognitive skills, followed by teachers' social relations.

Regarding affective skills, Table 5 shows that the first teachers' input (teachers' attitude to work) provides a 12 per cent contribution to educational outcomes in model 1. The inclusion of teachers' social relations led to a 7 per cent change in model 2, increasing the contribution of teachers' inputs from 12 to 19 per cent in model 2. This implies, regarding affective skills, that teachers' inputs (such as attitudes to work and their social relations) may be held responsible for 12 and 7

Table 6. Relative contributions of specific teachers' inputs to educational outcomes generally and in terms of CAPs					
Variables	**Model**	**Predictors**	**β**	**t**	**SE**
Educational outcomes generally	1	Teachers' attitudes to work	.33	10.21***	2.14
	2	Teachers' attitudes to work	.26	7.87***	2.25
		Teachers' social relations	.18	5.45***	2.31
Cognitive skills	1	Teachers' attitudes to work	.33	10.16***	2.06
	2	Teachers' attitudes to work	.26	7.86***	2.16
		Teachers' social relations	.18	5.32***	2.22
Affective	1	Teachers' attitudes to work	.35	11.10***	0.06
	2	Teachers' attitudes to work	.26	8.01***	0.06
		Teachers' social relations	.27	8.13***	0.06
Psychomotor skills	1	Teachers' attitudes to work	.35	10.94***	0.03
	2	Teachers' attitudes to work	.25	7.80***	0.03
		Teachers' social relations	.27	8.38***	0.04

per cent of the overall variation in educational outcomes, respectively. Overall, teachers' input accounts for 19 per cent of the variation in educational outcomes in terms of affective skills, with the remaining 81 per cent of unexplained variation attributable to other factors not included in the model. According to Table 5, teachers' attitudes to work contributed the most to educational outcomes regarding affective skills, followed by teachers' social relations.

In terms of psychomotor skills, Table 5 indicates that in model 1, the first teachers' input (teachers' attitude to work) contributes 12% to educational results. Model 2 saw a 7% change because of the addition of teachers' social relations, resulting in an increase in the contribution of teachers' inputs from 12 to 19% in model 2. This means that teachers' inputs, such as their attitudes to work and social relations, account for 12 and 7% of the total variance in educational outcomes in terms of psychomotor skills, respectively. Furthermore, regarding psychomotor skills, teachers' inputs account for 19% of the variance in the educational outcome, with the remaining 81% of unexplained variation possibly due to other variables not included in the model. Teachers' attitudes to work, followed by teachers' social relations, had the most significant impact on educational outcomes regarding psychomotor skills.

The results in Table 6 show that all the teachers' input (teachers' attitude to work and social relations) made significant independent contributions to educational outcomes generally and

specifically in CAPs, respectively. Based on the result in Table 6, the following hierarchical linear models are fitted.

$$\text{Model 1: EO} = 0.33_{AW} + 194.12\ (0.11) \tag{17}$$

$$\text{Model 2: EO} = 0.26_{AW} + 0.18_{SR} + 190.99\ (0.14,\ 0.03) \tag{18}$$

$$\text{Model 1: CS} = 0.33_{AW} + 186.24\ (0.11) \tag{19}$$

$$\text{Model 2: CS} = 0.26_{AW} + 0.27_{SR} + 183.38\ (0.14,\ 0.03) \tag{20}$$

$$\text{Model 1: AS} = 0.35_{AW} + 5.09\ (0.12) \tag{21}$$

$$\text{Model 2: AS} = 0.26_{AW} + 0.27_{SR} + 4.91\ (0.19,\ 0.06) \tag{22}$$

$$\text{Model 1: PS} = 0.27_{TAW} + 3.00\ (0.12) \tag{23}$$

$$\text{Model 2: PS} = 0.25_{TAW} + 0.27_{SR} + 2.89\ (0.19,\ 0.07) \tag{24}$$

6.4. Research question 2

What are the relative and composite contributions of administrators' inputs to educational outcomes generally and specifically in terms of cognitive, affective, and psychomotor skills in public secondary schools? The independent variable in this research question is administrators' inputs (leadership styles and attitude towards accountability). Educational outcome is the dependent variable. The dependent variable was addressed both broadly and explicitly in terms of CAPs. Because of the data and measurement nature, all variables in this research question are continuous. Hierarchical linear regression analysis (Table 7) was utilised to address the research question.

Table 7 revealed that the first administrators' input (leadership style) contributes 33% to educational outcomes generally in secondary schools. The addition of attitude towards accountability (as the second administrators' input) to model 2 raised the contribution of administrators' inputs from 33 to 53%, resulting in a 20% increment. This means that administrators' input, such as leadership style and attitude towards accountability, generally contribute 33% and 20% to educational outcomes. Furthermore, Table 7 shows that administrators' inputs account for 53% of the overall variation in educational outcomes, with the remaining 47% attributable to factors outside of model 2. Leadership style, trailed by attitude toward accountability, are significant contributors to educational outcomes generally in secondary schools.

Table 7 shows that the first administrators' input (leadership style) adds 33 per cent to model 1 regarding educational outcomes in terms of cognitive skills. The inclusion of administrators' attitudes toward accountability in model 2 resulted in a 19% shift, bringing the total contribution of administrators' input from 33 to 52 per cent. This implies that administrators' leadership style and attitudes toward accountability explain 33 and 19% of the overall variation in educational outcomes regarding cognitive skills, respectively. In a composite sense, administrators' input accounts for 52 per cent of the overall variation in educational outcomes regarding cognitive skills. Thus, the remaining 48% per cent of the unexplained variance is likely due to other factors not included in the model. Comparatively, administrators' leadership styles had the highest contribution to educational outcomes in terms of cognitive skills, trailed by their attitudes towards accountability, according to Table 7.

In terms of affective skills, Table 7 indicates that the first administrators' input (leadership style) brought a 39% contribution to educational outcomes in model 1. Model 2 saw an 18% change in affective skills because of the addition of administrators' attitude towards accountability, increasing the contribution of administrators' input from 39 to 57%. This means that, in terms of affective

Dependent variables	Model	R	R^2	Adj. R^2	SE	ΔR^2	ΔF	df_1	df_2
Educational outcome generally	1	.57[a]	.33	.33	168.40	.33	423.81***	1	868
	2	.73[b]	.53	.53	141.51	.20	362.18***	1	867
Cognitive skills	1	.57[a]	.33	.32	161.88	.33	417.55***	1	868
	2	.72[b]	.52	.52	136.13	.19	360.51***	1	867
Affective skills	1	.63a	.39	.39	4.25	.39	556.78***	1	868
	2	.76[b]	.57	.57	3.56	.18	366.90***	1	867
Psychomotor skills	1	.63[a]	.39	.39	2.49	.39	564.45***	1	868
	2	.76[b]	.57	.57	2.10	.18	353.50***	1	867

Table 7. Hierarchical regression results summary of the relative and composite contributions of administrators' inputs to educational outcomes

skills, administrators' inputs, such as their leadership style and attitude towards accountability, partially account for 39 and 18% of the total variance in educational outcomes, respectively. Generally, Table 7 disclosed that administrators' input accounts for 57% of the variance of the educational outcome in affective skills, with the remaining 43% of the unaccounted variance possibly due to other variables not included in model 2. Administrators' leadership style, trailed by administrators' attitudes towards accountability, made substantial contributions to the educational outcomes regarding affective skills, based on the evidence presented in Table 7.

Regarding the last dimension (psychomotor skills), Table 7 indicates that the first administrators' input (leadership style) contributes 39% to educational outcomes in model 1. Including administrators' attitudes towards accountability (to Model 2) resulted in an 18% rise from 39 to 57%. This implies that administrators' inputs, such as their leadership style and attitudes towards accountability, are responsible for 39 and 18% of the overall variation in educational outcomes regarding psychomotor skills, respectively. Furthermore, administrators' inputs account for 57% of the variance in educational outcomes in psychomotor skills, with the remaining 43% of the unexplained variation attributable to other factors extraneous to model 2. Although both inputs made significant contributions, administrators' leadership styles had the most substantial contribution to educational outcomes regarding psychomotor skills, followed by their attitudes towards accountability.

Table 8 shows that both administrators' inputs contributed significantly to educational outcomes in public secondary schools, generally and specifically in the aspects of CAPs. The following hierarchical linear regression models are fitted in line with these results.

$$\text{Model 1: EO} = 0.57_{LS} + 168.40 \ (0.33) \tag{25}$$

$$\text{Model 2: EO} = 0.18_{LS} + 0.60_{ATA} + 141.51 \ (0.53, 0.20) \tag{26}$$

$$\text{Model 1: CS} = 0.57_{LS} + 161.88 \ (0.33) \tag{27}$$

$$\text{Model 2: CS} = 0.17_{LS} + 0.60_{ATA} + 136.13 \ (0.52, 0.20) \tag{28}$$

$$\text{Model 1: AS} = 0.63_{LS} + 4.25 \ (0.39) \tag{29}$$

$$\text{Model 2: AS} = 0.25_{LS} + 0.57_{ATA} + 3.56 \ (0.57, 0.18) \tag{30}$$

$$\text{Model 1: PS} = 0.63_{LS} + 2.49 \ (0.39) \tag{31}$$

Table 8. Relative contributions of specific administrators' inputs to educational outcomes generally and in terms of CAPs

Variable	Model	Predictors	β	t	SE
Educational outcomes generally	1	Leadership styles	.57	20.59***	2.29
	2	Leadership styles	.18	5.66***	2.57
		Attitude towards accountability	.60	19.03***	1.80
Cognitive skills	1	Leadership styles	.57	20.43***	2.20
	2	Leadership styles	.17	5.54***	2.47
		Attitude towards accountability	.60	18.99***	1.73
Affective skills	1	Leadership styles	.63	23.60***	0.06
	2	Leadership styles	.25	8.30***	0.07
		Attitude towards accountability	.57	19.16***	0.05
Psychomotor skills	1	Leadership styles	.63	23.76***	0.03
	2	Leadership styles	.26	8.56***	0.04
		Attitude towards accountability	.56	18.80***	0.03

$$\text{Model 2: PS} = 0.26_{LS} + 0.56_{ATA} + 2.10 \ (0.39, 0.18) \tag{32}$$

7. Discussion

The first major finding of this study indicated that teachers' inputs (attitudes to work and social relations) are associated with significant variance in students' learning outcomes across the three domains of learning. The results suggest that teachers' attitudes to work and social relations jointly predict students' cognitive, affective and psychomotor learning outcomes in secondary schools. This study predicted that teachers' inputs explained a significant proportion of variances in educational outcomes generally and across the three learning domains (cognitive, affective and psychomotor). This result supports previous studies that have found a significant relationship between teachers' attitudes to work and students' academic achievement in secondary schools (Kareem, 2018; Marlina et al., 2019; Rehman & Naz, 2019). An explanation for this result is that teachers are curriculum implementers and their inputs in attitude and social relations are essential in education production in any school system. This result supports the opinion of Fehintola (2014) that every educational system's development, success, and quality are inextricably linked to the calibre of instructors who contribute to it. Specifically, among the teachers' inputs in this study, teachers' attitude to work was the most vital contributor to the overall variance in students' outcomes when taking CAPs together. Their social relations follow this. The result also showed that adding teachers' social relations to teachers' attitudes to work increases the total variance of teachers' inputs in predicting students' learning outcomes across the three domains. The increment in the effect is attributable to teachers' interpersonal relationships with parents, colleagues, principals, and students in the school system. This result explains that teachers' attitude to work,

holding their social relations constant, boosts educational outcomes. The result strengthens other studies which documented that educational facilities cannot be utilised without suitable behavioural attributes to help students improve their academic performance (Elihami, 2022; Shara & Silalahi, 2022). This result also supports the findings of Kaptich et al. (2019) that the interpersonal relationship teachers have with students and their parents affects instructional settings in a school and thus affects students learning outcomes. Therefore, schools cannot maximise students' learning without recourse to quality teachers.

The second major finding of this study documented that administrators' inputs (leadership styles and attitudes towards accountability) jointly contributed to a high proportion of variance in students' learning outcomes in public secondary schools generally and across the three domains. The result means that improving school administrators' input will generally improve students' learning outcomes generally and speciically in terms of CAPs. More specifically, it was established in this study that administrators' leadership styles and attitudes towards accountability individually predict students' educational outcomes across the three domains. This study aligns with a higher education study which also found a significant direct effect of academic leadership competencies on students' cognitive, affective and skill (psychomotor) learning outcomes in Saudi Arabia (Radwan et al., 2021). Similarly, other studies across different cultural contexts have documented a favourable link between leadership styles and students' learning outcomes (Cao, 2022; Harapan & Wardiah, 2021). This result is evident because administrators of secondary schools determine the extent to which teaching and learning are delivered (Guvhu et al., 2021; Nwabueze & Ohia, 2020). Furthermore, the administrators are responsible for maintaining an effective school system through an effective workforce and a conducive school environment (Owan & Agunwa, 2019). This finding concurs with that of Sezerii (2018), which revealed that the purpose of principals is to promote quality secondary education. Principals' personal, administrative, and professional qualities and abilities are critical to achieving this aim. Like this study, it has been found that school principals significantly impact the quality of education in schools by engaging in dialogue with teachers and students, valuing their opinions, praising them for their accomplishments and providing positive feedback to the teachers and students (Wilkey, 2013).

Even though most of these studies focused mainly on the cognitive aspect of learning outcomes, their results constituted a basis for the current study. Nevertheless, the result of this study provided further support to another study in Portugal which documented that leadership styles significantly predicted physical education students learning outcomes across two domains—cognitive and psychomotor (Araújo et al., 2016). However, this study's second result contradicts other studies that provided evidence that leadership style does not significantly predict students' learning outcomes in secondary schools (Awodiji et al., 2019; Britwum et al., 2022). The disparity in the results indicates that further research is plausible to clarify the link between leadership styles and students' learning outcomes across the three domains, not just the cognitive aspect (which has been the core focus of opposing studies).

The current study further proved that principals' attitude toward accountability predicts (significantly) cognitive, affective and psychomotor learning outcomes in secondary schools. This result corroborates a recent study which found that accountability practices towards managing school financial and non-financial resources are significantly related to institutional goal fulfilment (Odigwe & Owan, 2022). Similarly, other research indicated that principals' accountability practices is significantly related to students' academic performance in secondary schools (Nnaji & Uzoigwe, 2021). On the contrary, a study found a very weak/non-existent relationship between the bureaucratic accountability of principals and students' learning achievement in Turkey (Pekince Kardaş, 2019). The variation in the results is understandable since the context of the current study differs from the opposing research. Besides, the methods used in contradicting studies also vary, thus, requiring that further studies be conducted for a better understanding across different cultural contexts.

The result of this study further indicated that leadership style was the most substantial contributor to the overall variance in students' learning outcomes across the three domains among the administrative inputs. According to this study's result, principals' attitude toward school accountability trails leadership styles by ranking. The finding supports the result of other studies that leadership styles and public relations are crucial predictors of school effectiveness (Owan et al., 2022; Wachira et al., 2017). This result explains that though principals' leadership styles have contributed to the changes in students' CAPs, their attitude towards accountability will increase their ability to maintain an effective school system where teaching and learning are heightened. Following Murtiningsih et al. (2019), principals have significant responsibility and must be well-qualified academically, professionally, and emotionally. These results are consistent with Erda (2017), who found that accountability is a crucial strategy for delivering high-quality education, tracking expenditures, and boosting student accomplishment.

8. Limitations and future research implications

The major limitation of this study is its overall reliance on quantitative methods. Whilst the quantitative approach provides advantages in making generalisations based on results drawn from a relatively large sample, it does not offer a rich explanation of how or why this study's predictor and criterion variables are linked. Although this does not, in any way, undermine the results of our study, future studies should use a mixed methods approach to correct the overlapping weaknesses of quantitative and qualitative methods with their strengths. Another limitation of this study is its scope, which did not allow for the incorporation of control/moderating variables such as teachers'/students' age, gender, work experience, academic qualification, class, and family background variables, among others. Consequently, we cannot say, for instance, whether principals' leadership styles predict learning outcomes across the three domains the same for male and female or younger and older students. However, it is generally believed that no study can answer all the questions surrounding a problem in one blow. Besides, the number of control variables that can moderate the relationship between two variables are usually so many that no single study can ever control all of them, no matter how rigorous the researchers are. Therefore, we suggest that future studies perform a multigroup analysis to test for moderating variables' role in the relationship between the two teachers'/administrators' inputs and students' learning outcomes across the three domains.

9. Conclusion

This study was conceived to examine if and to what extent two teachers' inputs (attitude to work and social relations) and two administrators' inputs (leadership styles and attitude towards accountability) predict students' cognitive, affective and psychomotor (CAP) learning outcomes in public secondary schools. Generally, it is concluded that teachers' and administrators' inputs strongly predict students' affective, cognitive, and psychomotor learning outcomes. Specifically, this study's findings provided evidence that the two teachers' input—attitude to work and social relations are very critical in promoting students' learning outcomes across the three domains. The study also showed that administrators' leadership styles and accounting practices uplift students' learning outcomes at the secondary education level. Therefore, the study has provided an answer to the question that teachers' and administrators' inputs matter in the educational outcomes of students. This study has contributed to the literature by developing and validating three instruments with good psychometric properties for future data collection in related areas. The study also has practical implications for teachers to adjust their work attitudes and social relations for acceptable CAP learning outcomes among students. The study also has implications for principals to be accountable and maintain effective leadership practices for quality learning outcomes in secondary schools. Based on the conclusion of this study, it is recommended that teachers display a favourable attitude toward work and build cohesive social ties with colleagues, students and other stakeholders. Principals should ensure that flexible leadership practices are adopted based on the needs or situation on the ground. Principals should also ensure transparency in managing school finances through consistent record-keeping practices.

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