



The Relationship Between Cognitive Dissonance and Academic Achievement in STEM versus Regular Schools in Lusaka, Zambia

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ABSTRACT

This paper sought to determine the relationship between cognitive dissonance and academic performance. Cognitive dissonance is indispensable in the school setting because not all learners like or excel in all academic subjects or pursue subjects that align with their intended careers. These conflicts often result in an increased level of cognitive dissonance, which hinders learning. Therefore, management of cognitive dissonance is key to improving academic performance. However, research on the relationship between cognitive dissonance and academic performance is limited. This study employed a cross-sectional survey design, comprising a sample of 200 randomly selected pupils from two secondary schools in Lusaka District. Data collection instruments included cognitive dissonance subscales and class-administered quizzes. Five out of eight measures of cognitive dissonance correlated negatively with academic performance. Results revealed a consistent pattern of negative associations between cognitive dissonance and academic achievement across domains. Overall, the Regular school group reported marginally elevated mean dissonance scores compared to the STEM school group. Following stratification of results by school type, Fisher's Z-tests indicated largely comparable effects of cognitive dissonance on achievement, with only six inter-group correlation differences reaching statistical significance. It is noteworthy that school-related dissonance more strongly affects perceived choice in Regular schools than in STEM schools. This is mainly because perceived choice is a critical psychological resource that protects students from the negative effects of school stress. Drawing on Festinger's (1957) theory of cognitive dissonance, these findings reveal that dissonance generally varies uniformly as a function of learning context; it also has a significant influence on academic achievement. In conclusion, these findings have significant implications for both research and practice.

Keywords: academic achievement, cognitive dissonance, STEM, Zambia

INTRODUCTION

Cognitive dissonance, arising from incongruent beliefs and attitudes towards academic subjects and career pathways, can impede students' academic performance. Festinger (1957) defined cognitive dissonance as the psychological discomfort experienced when behaviour contradicts existing attitudes or beliefs. This discrepancy induces psychological stress, prompting individuals to mitigate the dissonance through strategies such as modifying behaviour or cognition, or rationalising conflicting cognitions. Perceived choice mitigates cognitive dissonance, fostering a positive attitude towards the selected behaviour, especially when the action is perceived as voluntary (Montecinos, 2020). Beymer and Thompson (2015) established a correlation between intrinsic motivation and a natural interest in a subject, with choice enhancing intrinsic motivation more significantly in children than adults.

In Zambia, subject allocation in senior secondary school is predicated on academic performance in the Junior Secondary School Leaving Examination (Ministry of Education, 1996). Learners are further assigned to either an academic or vocational career pathway (Ministry of Education, 2013). This assignment may conflict with individual interests and career aspirations, potentially leading to cognitive dissonance when students are required to study subjects misaligned with their aptitudes or career goals. Such dissonance can negatively impact



academic outcomes. Research indicates that cognitive dissonance can hinder learning, resulting in diminished academic achievement (Balaman, 2020; Zaiedy, Nor, & Smith, 2019).

A paucity of research exists concerning the relationship between cognitive dissonance and academic achievement, particularly within the Zambian educational context, given its unique cultural and educational imperatives (Al Otaibi, 2012; Kaani & Machila, 2022). Guided by Festinger's (1957) cognitive dissonance theory, this study investigates the influence of cognitive dissonance on academic achievement among secondary school students in Zambia. The limited extant research underscores the necessity for further investigation in this area.

Effective management of cognitive dissonance is crucial due to its association with diminished academic achievement, disruptive behaviour, and learner disengagement (Balaman, 2020; Tyler, Burris, & Coleman, 2016). Academic achievement, defined as the level of performance in school subjects as measured by examinations (Kohli, 1975, as cited in Das Kumar et al., 2018) demonstrated variabilities in relationships with cognitive dissonance across studies. Anchor and Abuli (2020) found that instructional strategies addressing cognitive dissonance enhanced academic performance compared to conceptual pedagogy and traditional methods. Similarly, Shimimol and Kaya (2017) reported a positive correlation, while Khalaj and Savoji (2018) identified a negative relationship between academic achievement and cognitive dissonance.

Forms of Cognitive Dissonance and their Relationship with Academic Achievement

Cassel, Chow, and Reiger (2001) identify several cognitive dissonance types pertinent to home and family, emotional control, personal adjustment, health and wellbeing, school and learning, socialisation, perpetuation, and dominance. Family-induced dissonance arises from incongruence between the domestic environment and societal norms, often stemming from parental neglect. The family environment, encompassing physical and psychological conditions within the home, significantly influences a child's personality and academic achievement (Krauss, Orth & Robins, 2020). Taseer et al. (2023) found that familial involvement is a key determinant of academic performance, fostering improved grades, attendance, and learning motivation. However, the misalignment between Zambian cultural values and Western educational paradigms can induce significant cognitive dissonance among learners (Kaani & Machila, 2022).

Secondly, socialisation-related cognitive dissonance can impede learning. Bagum, Khan, and Tehsain (2022) found a positive correlation between socialisation levels and academic performance at the secondary level, noting that socialisation enhances confidence and communication skills. Similarly, Yu et al. (2023) reported a significant positive relationship between academic performance and interpersonal relationships, particularly between students and their parents, teachers, and peers, among fourth and eighth graders.

Thirdly, personal adjustment to the learning environment is crucial for academic success, given the evolving nature of scholastic progression. Studies examining the relationship between academic achievement and psychological adjustment have yielded mixed results. Fateel (2019) reported a positive correlation, whereas Mondol (2022) found a negative association between academic performance and personal adjustment. Furthermore, maladjustment can precipitate mental health issues and school dropout, necessitating counselling interventions (Kaani, 2006; 2021). Conversely, well-adjusted learners exhibit enhanced learning motivation, leading to improved academic performance.

Fourthly, impaired health status is likely to negatively impact learners' academic performance (Agnafors, Barmark & Sydsjo, 2020). Fifthly, emotional regulation, the capacity to manage dissonance-induced discomfort, is another factor influencing academic achievement, with a positive relationship observed between emotional control and learning. Research indicates that academic anger correlates with higher learning gains compared to sadness, while confusion and boredom exhibit a negative correlation. Anxiety also demonstrates a negative correlation with academic performance (Tang & He, 2023).

Sixth, dominance, reflecting assertiveness or confidence, and perpetuation, denoting self-sustenance or perseverance, also play a role. Wolters and Hussain (2014), examining the relationship between grit, self-regulated learning, and academic achievement, found that perseverance is positively associated with self-



efficacy, cognitive and metacognitive strategies, time management, motivational regulation, and academic achievement. Similarly, Khasawneh, Gosling, and Williams (2021) reported a positive correlation between students' mathematics self-efficacy and performance. Self-efficacy is a key determinant of successful academic outcomes (Tiyuri, Sabeni, Shahrestanaki, Bayat & Selehiniya, 2016).

The Present Study

This study investigated the correlation between cognitive dissonance and academic performance in a cohort of learners from selected schools within the Lusaka District. The primary research questions addressed were: (a) What is the relationship between cognitive dissonance and academic performance in the selected secondary schools of Lusaka District? (b) How does cognitive dissonance influence attainment in both compulsory and optional subjects? Prior research presents conflicting evidence regarding the association between academic achievement and cognitive dissonance (Khalaj & Savoji, 2021; William, 2021). While some studies indicate a positive correlation (Kaya & Shimimol, 2017), others suggest a negative relationship (Balaman, 2020). Based on the aforementioned literature, it was hypothesised that an inverse relationship exists between the eight scales of cognitive dissonance and academic achievement.

Assignment of School Subjects and Career Pathways in Zambia

The Zambian education system employs a two-tiered career pathway structure culminating in the General Education Certificate, administered by the Examination Council of Zambia at grade 12. This structure comprises the Science, Technology, Engineering, and Mathematics (STEM) pathway, also referred to as the academic pathway, which emphasises pure science subjects (Physics, Chemistry, and Biology), Mathematics, and Humanities (Ministry of Education, 2013), and the vocational and technical pathway. The STEM pathway is typically reserved for high-achieving students demonstrating aptitude in the natural sciences, with the expectation of specialising in engineering, agricultural science, or science and technology disciplines. The vocational and technical pathway focuses on vocational and technical training, home economics, and hospitality. This tiered system further diversifies into eight specialised pathways, as detailed in Table 1.

Table 1: Career Pathways followed by Senior Secondary Schools in Zambia

Pathway	Subject/Specialisation
1. Natural Science Pathway	Physics, Chemistry, Biology, & Mathematics.
2. Agriculture Science Pathway	Agricultural Skills & science.
3. Technology Pathway	Computer Studies, Design & Technology, & ICT.
4. Home Economics & Hospitality	Catering, Tourism, & Home Economics
5. Social Sciences Pathway	Geography, History, Religious Education, & Languages.
6. Business and Finance Pathway	Commerce, Accounting, & Business Studies.
7. Performing and Creative Arts	Music, Art & Design, & Theatre.
8. Physical Education & Sports	Sports Science & Coaching.

The curriculum comprises seven compulsory and optional subjects to satisfy the minimum credit load. Core subjects include Mathematics, English Language, Biology, and Civic Education. For social science students, Science, Geography/History, and Literature in English are compulsory, with a minimum of one selection from Zambian Languages, Religious Education, or Foreign Languages. The natural science pathway mandates Mathematics, English Language, Chemistry, Physics, Biology, Additional Mathematics, and Civic Education, with Geography/History, Zambian Languages, and Religious Studies as optional (Ministry of Education, 2013).

Relationship between Cognitive Dissonance and Academic Performance

Although students are assigned to these pathways based on their performance in the grade 9 leaving examinations, many are assigned without due consideration to their career interests. The elective system is not conventionally applied, wherein learners make deliberate subject choices; instead, subjects are assigned based on prior final examination performance. The omission of student subject preference elicitation in some schools can induce cognitive dissonance. For instance, students aspiring to specialise in social sciences may be assigned to natural sciences based on higher examination scores.

Cognitive dissonance undoubtedly impacts academic achievement due to its relationship with motivation (Balaman, 2020). Cognitive dissonance leads to classroom maladaptive tendencies and disengagement from learning, affecting self-efficacy. Cognitive self-regulatory education positively affects academic burnout, cognitive dissonance and academic performance (Khalaj & Savoji, 2018) and improves students' academic performance by facilitating learning experiences and psychological wellbeing (Zaiedy et al., 2019). Students experiencing cognitive dissonance also face challenges in applying newly acquired knowledge and skills, resulting in increased emotional stress and diminished academic achievement. However, cognitive conflict instruction strategies, involving identifying student current knowledge and confronting students with contradictory knowledge, enhances academic performance more than conceptual pedagogy and traditional instructional strategies, in the face of cognitive dissonance (Anchor & Abuli, 2020; Kaani, 2021).

METHOD

Participants: The sample consisted of 200 participants selected using stratified random sampling, ensuring equal representation from two secondary schools in the Lusaka District. Ages ranged from 13 to 21 years ($M = 16.03$, $SD = 1.14$), comprising 36.5% girls and 63.5% boys, with the higher number of boys due to the difference in response rate. The STEM school sample was slightly older ($M = 16.69$, $SD = 1.17$) than the regular school sample ($M = 15.46$, $SD = 0.73$). The two schools were chosen based on their difference in academic performance; one being a STEM school and the other a regular school. The STEM school generally enrolls students who score high grades, while the other enrolls any learner who meets the minimum passing standards in the Junior Secondary Leaving Examination at Grade 9 level. Eleventh-grade learners were chosen because they had already adjusted to the transition from tenth grade.

Measures: The Cognitive Dissonance Scale (DSS) was used to elicit cognitive dissonance, while class tests composed of examination questions elicited academic achievement.

Cognitive Dissonance Scale [DSS] (Cassel, Chow, & Reiger, 2001): This questionnaire consists of eight subscales, each measuring a distinct component of cognitive dissonance. The first part of the scale focuses on personal domains, including home and family, emotional control, personal adjustment, and health and well-being. The second part covers school and learning, socialisation, perpetuation, and dominance. The DSS operates under the assumption that test-takers share society's views and expectations. Responses to the true or false questions are reviewed to assess alignment with societal norms. A higher score on the scale indicates a greater presence of cognitive dissonance in an individual's life (Cassel et al., 2001). The total scale score is 200, with each subscale having a maximum score of 25.

Academic Achievement Test: Academic achievement was measured by common class tests in the optional and compulsory subjects, and the composite score of the two. The tests were prepared by subject experts in each academic area, based on the current school syllabus. The test setters had vast experience in setting examination questions for the national examination syndicate, the Examinations Council of Zambia. The raw scores ranged between one and four, calculated by creating four performance bands (1 = 0 to 25; 2 = 26 to 50; 3 = 51 to 75; 4 = 76 to 100).

Data Collection Procedure: Participation was voluntary, and both participants and their parents provided consent. The questionnaires were distributed to learners after lessons, allowing them sufficient time to answer

the questions within the school premises. The completed questionnaires were collected immediately. The tests were administered with the aid of class teachers teaching the particular subjects.

RESULTS

This study examined the relationship between cognitive dissonance and academic achievement in grade 11 students from two schools (Regular vs. STEM) within the Lusaka District. Inter-group differences in cognitive dissonance levels were also investigated. Descriptive statistics for cognitive dissonance variables are presented in Table 1, stratified by school type and for the overall sample. For the overall sample, the Perpetuance (M = 13.32, SD = 4.27) and Personal Adjustment (M = 13.13, SD = 3.53) subscales exhibited the highest mean scores, whilst the Subject Total (M = 2.58, SD = 1.15) and Compulsory (M = 2.29, SD = 1.13) subscales demonstrated the lowest. The aggregate mean for the primary outcome, the DSS Total Score, was 11.30 (SD = 3.03), with similar values observed for the Internal and Personal Total (M = 10.98, SD = 3.15) and External and Impersonal Total (M = 11.62, SD = 3.24) subscales.

Table 2: Cognitive Dissonance Descriptive Statistics for STEM and Regular School

Variable	STEM		Regular		Overall	
	M	SD	M	SD	M	SD
Family	7.54	3.85	6.47	3.82	6.97	3.86
Emotional	10.96	3.68	12.01	4.75	11.52	4.30
Personal Adjustment	12.44	3.34	13.73	3.59	13.13	3.53
Healthy And Wellbeing	12.10	4.25	12.45	4.56	12.29	4.41
School And Learning	10.23	3.87	10.26	4.26	10.25	4.07
Socialisation	10.42	3.68	12.06	4.35	11.30	4.12
Perpetuance	13.01	4.19	13.58	4.34	13.32	4.27
Dominance	11.41	3.64	11.79	3.58	11.62	3.60
Internal And Personal Total	10.76	2.89	11.16	3.37	10.98	3.15
External And Impersonal Total	11.27	2.94	11.92	3.46	11.62	3.24
DSS Total Score	11.01	2.74	11.54	3.25	11.30	3.03
Subject Total	2.62	1.21	2.53	1.10	2.58	1.15
Compulsory	2.38	1.16	2.21	1.11	2.29	1.13
Optional	3.19	1.09	3.07	1.12	3.13	1.10
Perceive Choice	3.37	0.97	2.74	1.20	3.03	1.14
Ability To Lies	8.42	2.75	8.04	3.40	8.22	3.11
Age	16.69	1.17	15.46	0.73	16.03	1.14

With regard to the cognitive dissonance subscales, the Regular school group reported marginally elevated mean scores compared to the STEM school group. This trend was observed for Emotional (STEM: M = 10.96, SD = 3.68; Regular: M = 12.01, SD = 4.75), Personal Adjustment (STEM: M = 12.44, SD = 3.34; Regular: M = 13.73, SD = 3.59), and Socialisation (STEM: M = 10.42, SD = 3.68; Regular: M = 12.06, SD = 4.35). Consequently, the Regular school group also presented a slightly higher DSS Total Score (M = 11.54, SD = 3.25) compared to the STEM school group (M = 11.01, SD = 2.74). Statistically significant mean differences were identified between the two schools for Family ($F(1,198) = 3.88, p < .05$), Personal Adjustment ($F(1,198) < 6.83, p = .001$), Socialisation ($F(1,198) = 8.12, p < .01$), and Perceived Choice ($F(1,198) = 16.24, p < .01$), with the Regular

school group exhibiting higher mean scores in each instance. The remaining mean differences did not reach statistical significance.

Noteworthy inter-group differences were also observed in choice-related variables. Students in the STEM school reported a higher mean for Perceived Choice ($M = 3.37$, $SD = .97$) compared to those in the Regular school ($M = 2.74$, $SD = 1.20$). Correspondingly, the groups demonstrated similar mean scores for Subject Total, Compulsory, and Optional subjects, with only minor differences of approximately .10 to .20 points. Lying exhibited comparable means across the STEM ($M = 8.42$, $SD = 2.75$) and Regular ($M = 8.04$, $SD = 3.40$) school groups, indicating a level of similarity despite the observed disparities in other cognitive dissonance dimensions.

Academic Achievement and Cognitive Dissonance

Furthermore, the relationships between academic achievement, as measured by overall subject performance, compulsory subjects, and optional subjects, and cognitive dissonance were examined. Results revealed a consistent pattern of negative associations between cognitive dissonance and academic achievement across domains. Significant differences were only observed between compulsory and optional subjects. Overall cognitive dissonance exhibited negative correlations with the three measures of school achievement: overall subject achievement ($r = -.18$, $p < .01$), compulsory subjects ($r = -.19$, $p < .01$), and optional subjects ($r = -.17$, $p < .05$). These results suggest that students with lower academic achievement reported significantly higher levels of cognitive dissonance.

Furthermore, lower academic performance was significantly associated with the emotional dominance, external and impersonal dissonance, school and learning, and perpetuance subscales (Table 3). Among the statistically significant subscales, the emotional subscale exhibited the strongest association with overall subject and compulsory subject achievement. These findings suggest that poor emotional regulation, adherence to social hierarchy, external pressures, the academic learning environment, and learners' ongoing mental discomfort arising from conflicting beliefs, attitudes, or behaviours exerted a negative influence on learning among grade 11 students in Lusaka District. Dissonance based on physical and psychological wellness correlated only with performance in compulsory subjects ($r = -.15$, $p < .05$), and not across all subjects and options. Additionally, personal crisis arising from guilt and tension from a contradictory self-concept had statistically significant associations with performance across all subjects ($r = -.16$, $p < .05$) and compulsory subjects ($r = -.17$, $p < .05$).

Table 3: Academic Achievement and Cognitive Dissonance

Subscale	All Subjects	Compulsory	Optional
Family	—	—	—
Emotional	-.20**	-.20**	-.17*
Personal Adjustment	—	—	—
Health and Wellbeing	—	-.15*	—
School and Learning	-.15*	-.19**	-.20**
Socialisation	—	—	—
Perpetuance	-.16*	-.16*	-.16*
Dominance	-.20**	-.16*	-.20**
Internal and Personal	-.16*	-.17*	—
External and Impersonal	-.19**	-.19**	-.20**



Perceive Choice	—	—	—
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Note: ** p = .01 (2-tailed); * p = .05 level (2-tailed).

Counter-intuitive findings indicated a minimal association between optional subject performance and dissonance, despite optional subjects typically assigned based on grade 9 leaving examination results without consideration of students' academic aptitudes and career interests. Conversely, optional subject performance exhibited higher associations with dissonance ($r = .20, p < .01$). Cognitive dominance based on school and learning, and external and impersonal domains was correlated with overall compulsory subjects. These results suggest that restricted subject choice, incongruent with perceived self-concept and career aspirations, may induce significant cognitive dissonance and negatively impact performance.

Furthermore, several cognitive dissonance subscales demonstrated no relationship with academic achievement. Dissonance related to family dynamics ($r = -.03$ to $.02$, n.s.), personal adjustment ($r = -.11$ to $-.14$, n.s.), and socialisation ($r = -.10$ to $-.12$, n.s.) were not associated with any academic achievement measures. These findings suggest that cognitive dissonance in these domains is independent of academic performance, indicating aetiology rooted in extra-academic factors.

Perceived subject choice correlated negatively and significantly with overall subject achievement ($r = -.25, p < .01$) and compulsory subject achievement ($r = -.24, p < .01$), but not with optional subject achievement. This inverse relationship suggests that high-achieving students in overall and compulsory subjects perceive less choice, potentially reflecting the demands of high-performance academic environments. Furthermore, perceived choice did not significantly correlate with any cognitive dissonance subscales, thereby precluding a mediatory role. Consistently, elevated levels of emotional, social hierarchy, external pressure, and school-learning dissonance correlated with diminished academic achievement, particularly in optional subjects. Compulsory subject performance uniquely correlated with health and well-being dissonance, whereas optional subjects exhibited the strongest associations with learning environment and external systems dissonance. Overall academic achievement demonstrated minimal association with the family, personal adjustment, and socialisation domains of cognitive dissonance. The observed inverse relationships concerning perceived choice necessitate further empirical inquiry to elucidate underlying causal mechanisms.

Subsequent analyses investigated the mediation and moderation roles of perceived choice, age, and self-reported deceptive behaviour in the relationship between academic achievement and cognitive dissonance. A complex interplay was observed, wherein perceived choice exhibited significant negative correlations with multiple dissonance subscales: school and learning ($r = -.23, p < .01$), emotional ($r = -.18, p < .05$), socialisation ($r = -.18, p < .05$), external and impersonal ($r = -.17, p < .05$), and the overall dissonance score ($r = -.15, p < .05$). Controlling for perceived choice, the direct effects between academic achievement measures and the school and learning, emotional conflict, external pressures, and social dynamics subscales of dissonance became statistically non-significant, thus confirming full mediation.

Table 4: Correlations of Academic Achievement and Cognitive Dissonance as moderated Perceived Choice of Subjects, Age, and Telling Lies

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1.00																
2	.37**	1.00															
3	.36**	.63*	1.00														
4	.40**	.54*	.58*	1.00													



5	.36**	.54*	.42*	.47**	1.00												
6	.35**	.69*	.65*	.58**	.55*	1.00											
7	.27**	.52*	.52*	.59**	.45*	.50*	1.00										
8	.35**	.57*	.51*	.56**	.49*	.60*	.63**	1.00									
9	.68**	.82*	.81*	.82**	.58*	.73*	.61**	.64*	1.00								
10	.42**	.72*	.65*	.68**	.77*	.82*	.80**	.83*	.79**	1.00							
11	.57**	.81*	.77*	.79**	.72*	.82*	.75**	.78*	.95**	.95*	1.00						
12	-.03	-.20*	-.11	-.14*	-.15*	-.12	-.16*	-.20*	-.16*	-.19*	-.18*	1.00					
13	-.05	-.20*	-.14	-.15*	-.19*	-.12	-.16*	-.16*	-.17*	-.19*	-.19*	.88*	1.00				
14	.02	-.17*	-.11	-.13	-.20*	-.10	-.16*	-.20*	-.13	-.20*	-.17*	.70*	.50*	1.00			
15	-.08	-.18*	-.02	-.05	-.23*	-.18*	-.01	-.12	-.11	-.17*	-.15*	-.01	-.01	.03	1.00		
16	.05	.03	.00	-.05	-.04	-.05	-.05	.04	.01	-.03	-.01	-.25*	-.24*	-.08	-.05	1.00	
17	.06	-.22*	-.20*	-.16*	-.11	-.24*	-.15*	-.17*	-.17*	-.21*	-.20*	.12	.11	.09	.12	-.04	1.00

Note: ** p = .01 (2-tailed); * p = .05 level (2-tailed). 1 = Family; 2 = Emotional; 3 = personal adjustment; 4 = Health and Wellbeing; 5 = School and Learning; 6 = Socialisation; 7 = Perpetuance; 8 = Dominance; 9 = Internal and Personal; 10 = External and Impersonal; 11 = DSS Total Score; 12 = Subject Total; 13 = Compulsory Subject Total; 14 = Optional Subject Total; 15 = Telling Lies; 16 = Perceived Choice; 17 = Age of Participants

Age demonstrated correlational patterns consistent with moderation, exhibiting statistically significant negative correlations with emotional ($r = -.22, p < .01$), personal adjustment ($r = -.20, p < .01$), socialisation ($r = -.24, p < .01$), external and impersonal ($r = -.21, p < .01$), and overall dissonance ($r = -.20, p < .01$). This indicates that older students report lower dissonance in these domains compared to their younger counterparts. Although age displayed weak negative associations with academic achievement, implying a marginal propensity for them to attain lower academic outcomes. Given their consistent reports of reduced dissonance, irrespective of perceived choice or achievement levels, it is posited that developmental maturation may mitigate cognitive conflict within academic contexts. Students' self-reported deceptive behaviour exhibited the most intricate pattern of associations, suggesting a potential moderating role in the perceived choice-dissonance relationship, potentially amplifying effects on academic achievement. This behaviour correlated significantly and positively with the



school and learning dissonance subscale ($r = .23, p < .01$), but not with the majority of other dissonance subscales. This suggests that it exacerbates dissonance, particularly within the school and learning environment. Conversely, deceptive behaviour was not directly associated with academic performance or perceived choice. Nevertheless, the significant positive correlation between this behaviour and school and learning dissonance ($r = .23$), coupled with the significant negative correlation between perceived choice and the same subscale ($r = -.23$), indicates a potential moderating interaction. Students engaging in such behaviour may experience heightened dissonance in academic contexts, thereby attenuating the protective effect of perceived choice. Consequently, perceived choice may be less efficacious in mitigating school-related dissonance for these students.

Stratification of results by school type and subsequent Fisher's Z-tests indicated largely comparable effects of cognitive dissonance on achievement, with only six inter-group correlation differences reaching statistical significance (Table 5). Specifically, school-related adjustment challenges demonstrated stronger negative associations with academic performance among non-STEM students compared to their STEM counterparts. For instance, the correlation between school-associated dissonance and perceived choice was significantly more pronounced in non-STEM students ($r = -.35, p < .01$) than in STEM students ($r = -.06, p > .05$), $Z = 2.62, p < .01$. Conversely, family adjustment was positively correlated with optional subject aggregate scores in STEM students ($r = .15$), but negatively in non-STEM students ($r = -.10$), $Z = 2.21, p < .05$. These findings underscore that the relationships between adjustment domains and academic outcomes are significantly moderated by school type.

Table 5: Fisher's Z-Tests, STEM and Regular School Correlation Coefficients

Variable Pair	STEM	Regular	Z-test
School Vs Perceive Choice	-.06	-.35**	2.62
Optional Vs Perceive Choice	-.15	.12*	2.23
Family Vs Optional	.15*	-.10	2.21
School Vs Optional	-.09	-.28**	2.13
School Vs Comp	-.10	-.26**	2.00
Family vs Perceive Choice	-.24*	-.04	1.99

Note: ** $p < .01$, * $p < .05$. Bolded values indicate the larger correlation in each significant pair

These findings suggest that higher levels of school-related adjustment difficulties experienced by students in Regular schools are more strongly associated with lower scores on compulsory subjects, optional subjects, and perceived choice, compared to STEM school students. This implies that school adjustment problems may be more detrimental to academic outcomes in the regular school context. Family related adjustment difficulties relate differently to academic choices depending on school type. Among STEM students, better family adjustment is associated with fewer optional subjects and lower perceived choice, whereas among regular students, the pattern is reversed or absent. Among regular students, taking more optional subjects is associated with greater perceived choice. Among STEM students, the opposite trend emerges more, optional subjects are associated with less perceived choice, possibly reflecting curriculum constraints or pressure.

School-related cognitive dissonance seems to reduce perceived choice ($r = -.35$) among regular students, which suggests an indirect mediating pathway explaining why school problems negatively impact academic achievement because of diminished perceived autonomy in choosing desired subjects. While among STEM students, it is family-related dissonance that reduces perceived choice ($r = -.24$), not school-related problems. Additionally, optional subject achievement positively correlates with perceived choice in Regular schools ($r = .12$), but shows a negative effect in STEM schools ($r = -.15$), which suggests that taking more optional subjects



enhances perceived choice only in regular schools. In STEM schools, more optional subjects may reflect curriculum pressure rather than genuine choice. Lying behaviour influences academic achievement negatively in both groups, but these correlations do not differ significantly across school type (all $Z < 1.0$, $p > .30$), which implies that lying operates similarly across school types and does not moderate or mediate the association between cognitive dissonance and academic achievement.

DISCUSSION AND CONCLUSIONS

This study sought to investigate the relationship between cognitive dissonance domains and academic achievement among Grade 11 students in Zambia, in addition to evaluating how school type (STEM vs non-STEM schools) moderates this relationship. Drawing on Festinger's (1957) classic theory of cognitive dissonance, the findings reveal that generally dissonance varies uniformly as a function of learning context; it also has a significant influence on academic achievement. In summary, these findings have serious implications for both theory and practice in Zambian secondary school education.

The study found that cognitive dissonance related to school had a significantly stronger negative influence on academic outcomes among students in regular schools. This was not the case for their counterparts in the STEM school. Specifically, students from the regular school who exhibit school adjustment problems showed significantly lower performance in both compulsory ($Z = 2.00$, $p < .05$) and optional subjects ($Z = 2.13$, $p < .05$). Their perceived choice ($Z = 2.62$, $p = .01$) also seems to show similar dynamics. This finding corroborates Montecinos's (2020) observation that the climate in the school setting disproportionately affects students with average academic achievement, which can be compounded by resource constraints.

In the Zambian education system, there is a clear divide in academic achievement between STEM and regular schools as a result of disparities in quality and student support systems provided (Ministry of Education, 1996). Unfortunately, although these debilitating factors affecting learning outcomes have been well-documented for a long time, nothing much has been done to alleviate their effects (Kaani, Mulubale, & Mulenga, 2016; Nakamba, Munsaka, & Kaani, 2024). Therefore, these results can be extended beyond policy concerns by demonstrating that achievement variations manifest not only in mean differences but also in the structure of psychological-academic relationships.

Additionally, it is noteworthy that school-related dissonance more strongly affects perceived choice in regular schools than in STEM schools. This is mainly because perceived choice is a critical psychological resource that protects students from the negative effects of school stress (Beymer & Thompson, 2015). Thus, the Beymer and Thompson's framework suggests that school-related dissonance could more severely affect the psychological resources that underpin perceived choice in schools, possibly activating a cascade of negative effects on academic engagement and performance due to diminished autonomy. This is consistent with Wolters and Hussain's (2014) arguments that knowing that one makes one's own decisions regarding subject choice mediates the correlation between learning environments and achievement outcomes.

Among students in the STEM school, performance in optional subjects has a positive association with cognitive dissonance related to family ($r = .15$), and has an inverse relationship among regular school students ($r = -.10$); the difference between the two correlation coefficients is statistically significant ($Z = 2.21$, $p = .05$). However, family dissonance correlated negatively with perceived choice only in STEM students ($r = -.24$, $p < .05$), but not in regular students ($r = -.04$), and there were statistically significant differences between the correlation coefficients ($Z = 1.99$, $p = .05$). These findings appear to suggest that family dynamics may be operating as a protective buffer depending on the school a student attends.

These results reflect cross-cultural research in collectivist educational contexts, like Zambia (Kaani & Machila, 2022; Al Otaibi, 2012), which indicates that in many non-Western community-centred societies, family involvement and support are crucial in any endeavour undertaken, including education. The outcomes are a function of the alignment between family expectations and school demands. It is, therefore, not surprising that Zambian secondary schools are encouraging parental engagement as a foundation for students' success in their academics (Ministry of Education, 2013). However, while agreeing with this observation, our results seem to suggest that this family engagement may vary as a function of school type; whereby family dissonance seems to

reduce perceived choice only in STEM, which may be a result of high family expectations and pressure exerted by parents of children in STEM schools. According to Das Kumar et al. (2018), strong family educational values tend to moderate student outcomes. Thus, the high academic aptitude of STEM students fosters strong family ties and high academic aspirations, which families of regular school students may not exhibit, rendering the influence of family dissonance less effective in making academic choices.

Perceived choice exhibited a positive association with optional subjects in regular schools ($r = .12$), while this relationship was negative in STEM schools ($r = -.15$; $Z = 2.23$, $p < .05$). This is a counterintuitive finding because one would have expected STEM students taking optional subjects to have elevated perceived choice levels. Therefore, this contradiction needs to be carefully interpreted. Studies by Balaman (2020) and Tyler and colleagues (2016) revealed that students in highly structured and demanding curricula such as the STEM programme tend to have a negative sense of autonomy in academic settings even when elective options exist, because it is examination-oriented and tailored towards meeting university entrance requirements. In the Zambian context, STEM schools enrol high-scoring students offering more challenging pure science-based curricula. Thus, enrolled students may not view choosing elective subjects as genuine choices, but rather as additional burdens meant to increase their workload.

By contrast, the positive associations observed between performance on optional subjects and perceived choice may be a result of curricular flexibility or lower performance pressure, which allows authentic expression of genuine interest in subject choice. This corroborates findings reported by Krauss et al. (2020), who found that perceived choice has a positive effect on students' academic outcomes, particularly among students who do not experience competing pressures from challenging subject demands. Similarly, Khasawneh and colleagues (2021) demonstrated that the association of either intrinsic or instrumental psychological choice is moderated by well-being. This may explain the contradictions in the patterns observed in these findings.

The dynamics observed may be attributed to culturally-induced factors inherent in the Zambian sociocultural fabric, particularly in education settings. First, the 2013 Zambia Curriculum Framework created a dual track education system with the STEM system focused on producing future scientists and attracting high-achieving students with demanding family systems (Kaani & Machila, 2022), whereas Ordinary schools usually serve average-achieving students. Thus, this dual classification may affect the interactions between the magnitude of dissonance processes and school achievement. Festinger (1957) argued that the magnitude of dissonance depends on conflicting cognitions, which varies according to the competition for assignment to either STEM or the conventional academic pathways.

Secondly, unlike the individualistic norms of Western ontological values, Zambia's collectivist cultural values tend to magnify the influence of family engagement (Agnafors et al., 2020; Kaani, 2006). This is because conflict caused by family dissonance has an influence on academic outcomes of students whose families value honour and obedience (Tang & He, 2023; Tao et al., 2021). Similarly, the double-edged sword achievement pressures coming from the student's family, which seem to enhance motivation in high-achieving STEM students and negatively affect low achievers in Regular schools, have been reported by Shimimol and Kaya (2017) and Khalaj and Savoiji (2018).

The third socio-cultural factor relates to the different definitions of perceived choice across the two schools. According to Wolters and Hussain (2014), perceived choice can be defined either as autonomy for its own sake (intrinsic perceived choice) or choice as a means to external goals. Hence, in STEM schools, students define optional subjects as vehicles for university entry, while regular school students consider choosing optional subjects as an autonomous act. Unfortunately, this undermines the expected benefits of making choices in subject selection (Anchor & Abuli, 2020; Cassel et al., 2001), which was the main aim of the study because perceived choice only plays an effective mediatory role between academic environment and achievement when choice is seen to be more authentic than when it is constrained by other factors (Tiyuri et al., 2016).

These findings have significant implications for both research and practice. We, therefore, suggest three recommendations that Zambia can implement to improve secondary education. First, there is a need to formulate interventions to reduce the effects of cognitive dissonance related to school environments. This will be particularly beneficial to students in regular schools because poor academic achievement is strongly affected by



school adjustment problems. Second, since there are significant differences in the effects of family engagement, we propose designing intervention programmes according to the targeted type of school by differentially increasing family involvement in ordinary schools and reducing it for STEM students. Third, increase perceived choice, particularly for STEM students, to allow them to feel genuinely responsible for subject choice by enhancing student voice in academic decisions (Balaman, 2020; William, 2021).

Despite providing interesting insights into the dynamics of the relationship between cognitive dissonance and achievement, the study may have a few limitations that merit acknowledgement. The use of a cross-sectional design may have attenuated observed causal relationships due to the non-inclusion of certain factors. Therefore, longitudinal designs should be considered in future research endeavours to determine how dissonance processes develop in the long term and consider including interesting factors such as family honour, educational aspirations, and pressure to pass examinations. Additionally, the study should also be replicated with larger samples and use standardised academic assessments.

In conclusion, this study found that the relationships between dissonance and academic achievement among Zambian Grade 11 students change as a function of school type. Regular school students are detrimentally affected by dissonance related to school environments. Family dynamics show distinct patterns across school types, and perceived choice operates as a differential mediator. These findings extend Festinger's (1957) original theory by demonstrating that dissonance effects are not universal but are shaped by educational context, cultural values, and the structural features of schooling systems. For Zambian educators and policymakers, these results emphasise the importance of context-sensitive approaches to supporting student adjustment and academic success.

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