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The dynamics of learning styles and adaptive flexibility in quantity surveying education: implications for academic performance

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ABSTRACT

This scholarly paper delves into the interplay between learning styles and academic performance within the specific context of quantity surveying (QS) education, thereby addressing an identified research gap. Its central objective is to scrutinise the impact of adaptive learning flexibility, a crucial element of experiential learning theories, on educational outcomes in QS. The study adopts a positivist paradigm, employing a deductive research approach and a survey methodology. It utilises Pearson's correlation analysis to ascertain the relationship between QS students' adaptive flexibility and their academic performance, with the study population comprising second, third, and fourth-year students at Nelson Mandela University. The research findings reveal a predominance of the assimilating learning style among QS students, characterised by a proclivity for abstract conceptualisation and theoretical model development. Notably, the study did not identify any statistically significant differences in academic performance across various learning styles. This suggests that learning style preferences may not be reliable indicators of academic success within QS education. Further, the research observed a minor negative correlation between adaptive flexibility and academic performance, challenging the notion that increased learning style flexibility invariably leads to better academic results. These outcomes imply that while QS students may exhibit substantial adaptive flexibility, this attribute does not necessarily correlate with enhanced academic achievement. The distinctiveness of this research lies in its exploration of the dynamic nature of learning styles and their influence on academic performance in the specialised field of QS. It significantly contributes to the wider educational discourse, underscoring the importance of personal experience in the learning process and advocating for pedagogical approaches that recognise and nurture individual learning preferences. In practical terms, the study recommends that QS students and educators engage in introspective practices to comprehend and utilise learning styles and adaptive flexibility effectively. It endorses the adoption of educational frameworks that embrace diverse learning modalities, thereby augmenting students' adaptability to various learning situations and deepening their academic comprehension. The paper also advises that QS educators receive professional development to incorporate experiential learning cycles into their teaching methodologies effectively. Overall, this research illuminates the complexities inherent in the learning processes of specialised educational fields. It calls for a nuanced appreciation of the interplay between individual learning styles and adaptive flexibility concerning academic performance. The findings establish a foundation for future investigations into these dynamics in other specialised educational settings and propose innovative instructional strategies for QS education.

Keywords: Academic performance, Adaptive flexibility, Kolb' experiential learning theory, Learning styles, Quantity surveying students

1. INTRODUCTION

As Benjamin Franklin once said, "Tell me, and I forget, teach me and I may remember, involve me and I learn." This timeless wisdom aptly underscores the essence of learning styles, a concept pivotal in understanding how individuals absorb and process information. Learning styles, characterised by unique habits, strategies, and mental behaviours, serve as a window into the diverse ways learners engage with knowledge during learning opportunities (Pritchard, 2013).

In educational theory, the exploration of learning styles has been significantly influenced by authoritative figures such as David Kolb. His learning style inventory, rooted in the experiential learning theory (ELT), distinguishes itself by identifying nine distinct learning styles: Initiating, Experiencing, Imagining, Reflecting, Analysing, Thinking, Deciding, Acting, and Balancing (Gogus and Ertek, 2016). This model builds on the foundational experiential works of Dewey, Lewin and Piaget, aiming to transcend the limitations inherent in cognitive and behavioural learning theories, which have been critiqued for overemphasising cognition and neglecting the role of subjective experiences (McCarthy, 2010).

Despite the established framework, a critical reevaluation reveals a gap. Traditional models often portray learning styles as static, overlooking their dynamic nature. This notion has been challenged by contemporary research, particularly by Passarelli and Kolb (2012), who argue that an individual's learning style is a dynamic aspect of their personality, adaptable to various learning contexts. This concept of adaptive learning flexibility is fundamental in understanding how students navigate their learning processes (Kolb and Kolb, 2013:26). However, applying these theories, particularly in specialised fields such as QS education, remains underexplored. This field's unique challenges and learning demands necessitate a deeper investigation into how adaptive learning flexibility influences academic performance. Therefore, to better understand this experiential learning process, this study aims to establish the relationship between QS students' adaptive flexibility and academic performance.

This study contends that understanding and harnessing the dynamic nature of learning styles can significantly enhance the educational experience and performance, especially in specialised fields such as QS that face unique educational challenges.

This paper will first review the theoretical underpinnings of learning styles and adaptive learning flexibility in the following sections. It will then detail the methodology adopted for investigating these concepts among quantity surveying students, followed by an analysis of the findings. Finally, the paper will discuss the implications of these findings for educational practices in specialised fields and suggest directions for future research.

2. LITERATURE REVIEW

This literature review below provides a comprehensive overview of the research on learning styles, adaptive flexibility, and their impact on academic performance, setting the stage for further discussion and analysis.

2.1 The experiential learning theory

The ELT is firmly anchored in the principles of constructivism, positing that learners arrive in educational settings equipped with knowledge gleaned from previous experiences. This approach, as articulated by Olusegun (2015), emphasises a progression from familiar knowledge to exploring unknown territories in the learning process. Constructivism advocates for a view of learning as an intentional and progressive deepening of understanding rather than a mere passive reception of information. Szili and Sobels (2011) argue that within this paradigm, the learner is central to educational endeavours, employing

their prior experiences as a foundation for constructing new knowledge in an accessible and meaningful manner.

This educational philosophy acknowledges the importance of factual knowledge but argues for its contextualisation within practical, real-life scenarios that prompt learners to engage in reflection, organisation, analysis, and problem-solving. As such, constructivism posits that knowledge acquisition and learners' experiences are intertwined rather than distinct entities. Jia (2010) further elucidates that while elements such as language shape knowledge, they do not lead to a uniform interpretation of academic content among learners.

The cyclical nature of the ELT, described by Manolis et al. (2013), involves learners traversing through four distinct stages: Concrete experience (CE), Reflective observations (RO), Abstract conceptualisation (AC), and Active experimentation (AE). The theory postulates that learning commences with a concrete experience, enabling learners to review and reflect upon their past actions. This reflection fosters the assimilation of abstract concepts, bridging the gap between practical experiences and theoretical academic content. These conceptual understandings are then tested through active experimentation, generating new experiences (Kolb and Kolb, 2013). Akella (2010) notes that while learners may enter this cycle at any point, the progression through these stages typically adheres to a chronological sequence. However, effective learning within this framework is contingent upon what Baker et al. (2012) describe as 'creative tensions' among these four learning modes. Figure 1 below illustrates the experiential learning theory cycle.

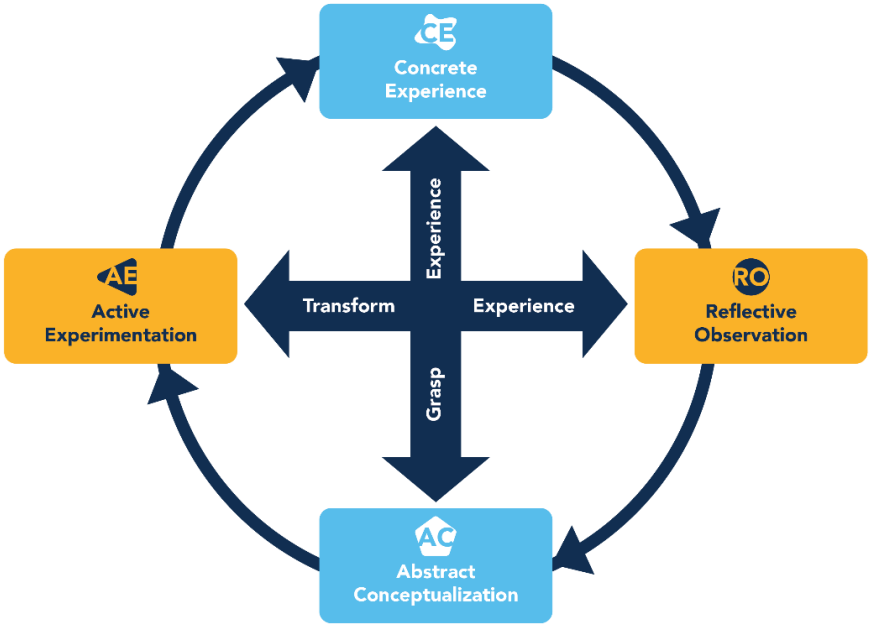

Figure 1. Experiential learning cycle
Source: Kolb and Kolb (2013:8)

2.2 Learning styles

Exploring individual learning styles reveals a significant diversity in how students approach and engage with education. As Komarraju et al. (2011) articulate, these distinct learning styles reflect a personalised approach, empowering students to be active and successful participants in their educational journey. Research in higher education, as demonstrated by Gray et al. (2018), underscores the critical role of active learning in enhancing academic performance. Active learning, defined by Dewing (2010) as an interactive process wherein

learners are actively engaged and reflective, contrasts sharply with passive information reception.

David Kolb's seminal work in the late 1960s introduced the concept of learning styles to acknowledge the uniqueness of each learner's information processing and organisational preferences. Nearly 100 diverse learning style frameworks and assessments exist, encompassing a broad spectrum of human individuality, cognitive styles, personality types, study strategies, instructional preferences, and sensory modalities (Peterson et al., 2015). Felder (2010) describes these as ranging from mild to strong preferences in various learning situations. Grounded in Kolb's extensive experiential learning theory, the learning style inventory integrates the insights of prominent 20th-century scholars such as Piaget, Dewey, James, Rogers, Freire, and Vygotsky. In 1984, Kolb identified four distinct learning styles—Diverger, Accommodator, Converger, and Assimilator—as depicted in Figure 2 (Tan and Laswad, 2015).

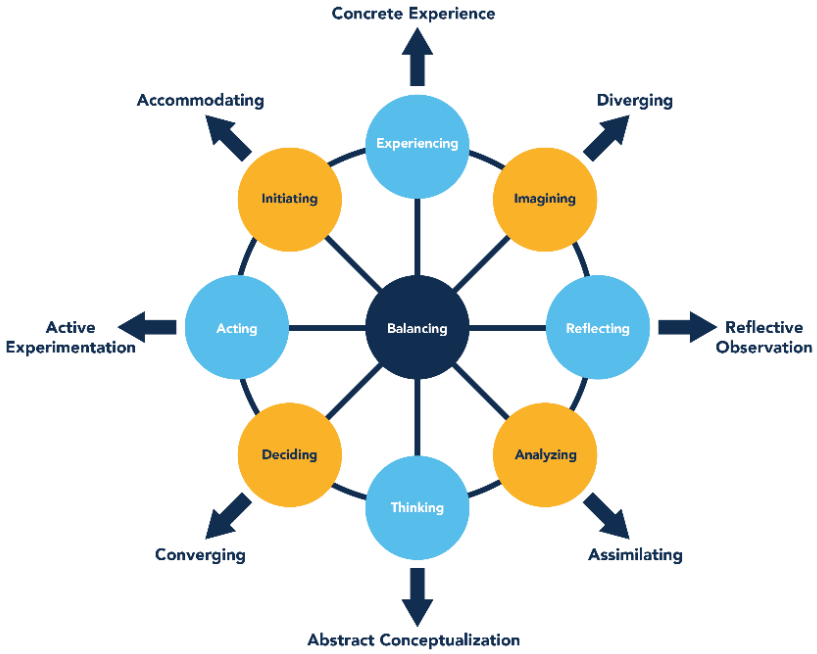

Figure 2. Learning styles
Source: Kolb et al. (2014)

The learning process necessitates that each learner focuses on, processes, comprehends, and retains new information, a process unique to each individual, indicative of varied processing styles. These differences necessitate accommodation by educators to foster long-term memory and retention (Pashler et al., 2008). In heterogeneous classroom environments, a one-size-fits-all approach often prevails, requiring students to adjust their learning styles to fit the instructional style. While this method may seem convenient, Romanelli et al. (2009) argue that it unfairly shifts the burden of alignment between teaching and learning onto the student, potentially hindering comprehension. Felder (2010) criticises this approach, suggesting that teaching incongruent with students' preferred learning styles can lead to disengagement and loss of motivation. Recognising the drawbacks of not accommodating diverse learning styles, it seems preferable to align instructional methods with student preferences. However, as Glonek (2013) cautions, when implemented as a primary pedagogical strategy, this approach can inhibit the development of adaptability in learners, leading to reduced confidence in new learning environments and a diminished appreciation for other learning methods. A more effective practice would be adopting a teaching paradigm

that accommodates multiple learning style dimensions, fostering academic self-efficacy while challenging students to broaden their flexibility of learning styles (Romanelli et al., 2009). As Peterson and Kolb (2017) note, it is important to acknowledge that learning styles are not fixed; learners can adopt different styles in varied learning environments.

Kolb's learning style inventory categorises learners into styles such as 'Initiating', 'Experiencing', 'Imagining', 'Reflecting', 'Analysing', 'Thinking', 'Deciding', 'Acting', and 'Balancing'. Each style represents a unique approach to learning, ranging from action-oriented 'Initiating' learners, who thrive in 'learning-by-doing' environments, to 'Balancing' learners, who adapt their style according to the demands of the learning situation (Kolb et al., 2014). These styles encompass a range of activities and preferences, highlighting the complexity and diversity of the learning process.

2.3 Adaptive flexibility

Kolb suggested an important dimension to the learning process: adaptive flexibility (Kolb and Kolb, 2013). This concept refers to a learner's capacity to modify their learning style in response to the varying demands of distinct learning situations. This adaptability implies that a learner's style is not a static attribute but a dynamic characteristic of their personality, which can be altered consciously or unconsciously, as Passarelli and Kolb (2012) have noted. The stability of a learning style is derived from a learner's consistent interaction patterns within their educational environment. This phenomenon, known as the accentuation process, suggests that learners' approach to one situation influences their choices in subsequent learning contexts (Kolb and Kolb, 2013).

Adaptive flexibility in learning stands in contrast to the accentuation process, as it necessitates the development of a more holistic approach to learning, moving from a focus on specialised learning styles to an integrated use of various styles. As Kolb and Sharma (2010) explain, this integration involves the utilisation of all nine learning styles in a recursive, context-sensitive process. However, Peterson and Kolb (2017) argue that individuals inclined towards reflective, analytical, and thinking learning styles, often found in scientific or mathematical professions, may face challenges in developing such adaptive flexibility.

Learners with high adaptive flexibility are typically more effective in their learning endeavours (Kolb and Kolb, 2009). These individuals tend to have a wider comfort zone, enabling them to transition smoothly between different learning modes, thereby fostering a more profound comprehension of academic material (Passarelli and Kolb, 2012). Furthermore, Kolb and Kolb (2013) observe that such learners often demonstrate a variety of 'back-up' learning styles, enhancing their efficiency and versatility throughout the learning process.

2.4 Student academic performance

Stakeholders, including employers and governmental entities, frequently employ metrics of academic success, such as first-time pass rates, examination grades, and continuous assessment grades, to evaluate the effectiveness and prestige of higher education institutions. Adebayo (2008) posits that the accomplishments of these institutions are intrinsically linked to their students' academic success. However, Bonsaksen et al. (2018) note that academic success is fundamentally a manifestation of academic performance, which indicates how effectively learners meet the educational objectives set by the institution. This concept extends beyond individual institutions, encompassing national and international educational landscapes.

Pascarella and Terenzini (2005) observe that student grades reflect a confluence of factors, including academic success, intellectual capabilities, academic skills, and the attainment of educational objectives. While Von Stumm et al. (2011) acknowledges grades

as central academic performance indicators, they also question their comprehensive value in reflecting student abilities.

Academic performance is a multi-dimensional construct comprising three primary aspects: the learner's characteristics, the instructor's competencies, and the learning environment. Adzharuddin (2014) highlights that the learner's characteristics are shaped by their individual learning style, approach, and experience. These characteristics are significant predictors of academic success or failure, and an institution's failure to recognise and cater to these differences can lead to suboptimal student performance (Pornsakulvanich et al., 2015).

Considerable research has investigated the potential correlation between students' learning styles and their academic performance. Azevedo and Akdere (2010) found no definitive positive or negative relationship between the learning styles delineated in Kolb's learning style inventory and classroom performance. Tan and Laswad (2015) found a notable correlation between students' preferred learning styles and academic achievements, suggesting that students perform differently depending on the assessment format. Supporting this perspective, Yi et al. (2011) contribute to the prevailing view that students with a converging (deciding) learning style often achieve greater academic success. These findings collectively underscore the imperative for academic content delivery to be tailored to students' diverse learning styles, a key factor in optimising academic performance, as Damavandi et al. (2011) argue.

3. RESEARCH METHODOLOGY

This research is underpinned by an epistemological framework that adopts a postpositivist philosophical stance, coupled with deductive reasoning, as outlined by Ellis et al. (2021) and Ghansah et al. (2021). The objective was to generalise findings among QS students and to explore the relationships between Kolb's ELT and their academic performance. The methodological approach of this study employed a survey strategy, justified as a systematic technique for gathering descriptive data from a representative sample. This approach aims to construct quantitative generalisations applicable to the broader population in alignment with the principles elucidated by Joye et al. (2017).

The design of this study facilitated the practical testing of theoretical constructs, echoing the approach of Ahmed et al. (2021). Such a methodology aligns with precedents in construction literature, thereby substantiating the validity of this research approach. Notably, analogous methodologies have been previously employed in studies within the construction sector. For instance, Stewardson et al. (2023) investigated the prevalent issue of late payments in the construction industry, while Taylor et al. (2022) focused on the conversion of former industrial premises into domestic dwellings. These examples serve to reinforce the appropriateness and credibility of the research design adopted in the current study.

3.1 Data collection

Both secondary and primary data were used for this practice-based research. The secondary data comprised the aggregated average marks of QS students across all completed modules. The study's sample included 232 students, although the first-year student cohort was excluded due to the unavailability of academic results at the time of the research. Consequently, the sample was narrowed down to 158 QS students enrolled during the academic year from the second, third, and fourth years.

Primary data was collected through the electronic dissemination of the Kolb Learning Style Inventory (KLSI) 4.0 questionnaire developed by the Korn Ferry Hay Group. The KLSI 4.0 questionnaire includes 20 items, with 12 focusing on learning in various contexts and the remaining eight aimed at assessing adaptive learning flexibility. Given the extensive internal and external validity evidence across multiple professions provided by Kolb and Kolb

(2013), conducting reliability tests such as Cronbach's alpha was deemed unnecessary. They reported that the KLSI 4.0 questionnaire achieved an internal reliability score of 0.81 on the Cronbach's alpha test, surpassing the threshold of 0.65 deemed sufficient for psychometric tests by Vaske et al. (2017).

Participants in the study were required to rank the endings of each sentence in the questionnaire according to their perceived alignment with their learning approach, with rank 1 being "Least like you" and rank 4 "Most like you". To ensure informed consent and adhere to stringent ethical protocols (cf. Fisher et al., 2018; Law et al., 2021), participants were sent a cover letter via email detailing the study's objectives and a link to the web-based survey portal.

Initially, the response rate to the questionnaire was low, prompting the dissemination of four reminder emails to the consenting participants at three-day intervals. Subsequently, four days after the fourth reminder, individual reports were emailed to the participants by a Korn Ferry Hay Group representative.

3.2 Data analyses

The data analysis in this study was conducted using a structured four-stage 'waterfall' process, characterised by its iterative nature. The first stage focused on identifying the predominant learning style among QS students. This was achieved by analysing Korn Ferry Hay Group reports detailing each respondent's learning style. Descriptive statistical methods were then applied to ascertain the most prevalent learning style within the QS student population.

The second stage examined the influence of learning styles on students' academic performance. This assessment used a one-way analysis of variance (ANOVA) to discern any statistically significant differences in academic performance across different learning styles.

The third stage of analysis involved evaluating students' adaptive flexibility. Adaptive flexibility was quantified using a coefficient scale ranging from zero (0), indicating no adaptive flexibility, to one (1), denoting full adaptive flexibility. Descriptive statistics were employed to interpret and present these findings.

Finally, the fourth stage aimed to determine the existence of a correlation between adaptive flexibility and academic performance among students. To this end, Pearson's product-moment correlation analysis was utilised, with a significance level set at $p = 0.05$. This analysis was instrumental in establishing whether a statistically significant correlation existed between the two variables.

4. FINDINGS AND DISCUSSION

Figure 3 illustrates the distribution of learning styles among students in the Department of Quantity Surveying. The findings reveal that the assimilator learning style is predominant, characterised by a preference for abstract concepts and the creation of theoretical models. Students with this style excel in logically processing and organising a broad range of information and are influenced by various theories and philosophies (Glonek, 2013). Following closely is the diverging style (f=19 or 26.39%), which involves viewing concrete situations from multiple perspectives and a preference for brainstorming sessions to generate new ideas for learning, often in group settings (Kolb et al., 2000).

The balancing learning style ranks third in prominence (f = 16 or 22.22%), representing an equilibrium among the four learning modes: concrete experience, reflective observation, abstract conceptualisation, and active experimentation. Subsequently, the converging style (f = 13 or 18.05%) is noted for its practical application of abstract ideas and theories and a preference for problem-solving environments (Yilmaz-Soylu and Akkoyunlu, 2009). The accommodating style, preferred by only (f = 3) 4.17% of respondents, involves concrete thinking and active processing (Olivos et al., 2016).

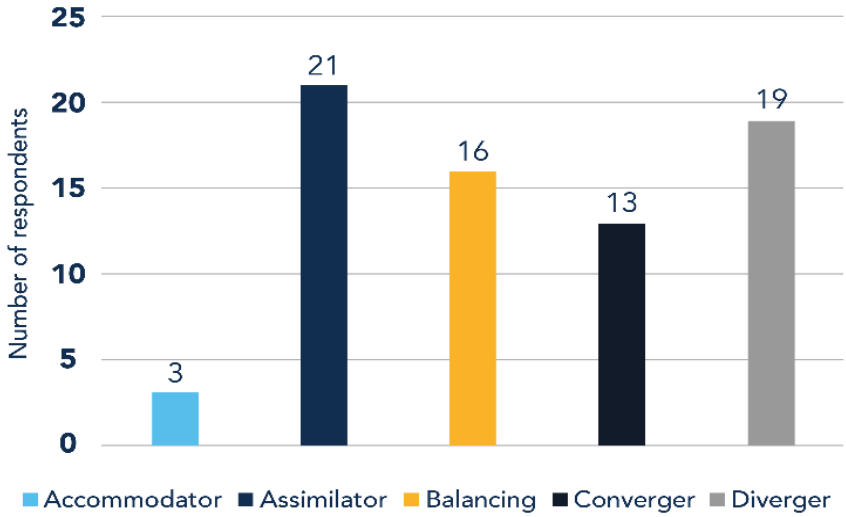

Figure 3. Learning styles

The respondents' adaptive flexibility was measured using the KLSI 4.0, in which eight questions were used to conduct this measurement. Table 1 indicates the respondents' mean, median, standard deviation, range, minimum and maximum adaptive flexibility. Adaptive flexibility is a variable ranging from zero (0) to one (1), zero (0) indicating no adaptive flexibility and one (1) indicating full adaptive flexibility.

Table 1: Descriptive statistics of adaptive flexibility

	Flexibility
Mean	0.78
Median	0.81
Standard deviation	0.14
Range	0.56
Minimum	0.43
Maximum	0.99
Skewness	-0.80
Mean	0.78
Median	0.81

The mean adaptive flexibility of 0.78 suggests that, on average, the respondents exhibit a high degree of learning flexibility, as Kolb and Kolb (2013) outlined. This indicates a capacity to shift between different learning modes comfortably. The left-skewed distribution, with a skewness of -0.80, implies that most respondents demonstrate adaptive flexibility above the mean, indicative of a holistic learning process that favours learning style integration over specialisation. These results align with Kolb and Kolb's (2013) findings, which suggest that university students typically display high adaptive flexibility, ranging between 0.72 and 0.76.

4.1 Descriptive results on dependent variable

The academic performance of respondents in this study was evaluated using their average grades from registered modules during the 2018 academic year. Table 2 presents a descriptive statistical analysis of their academic performance, offering a comprehensive overview of how the students fared academically.

Table 2: Descriptive statistics of respondents' academic performance

	Academic Performance
Mean	0.67
Median	0.65
Standard deviation	0.80
Range	0.33
Minimum	0.54
Maximum	0.87
Skewness	0.52

According to Table 2, the mean academic performance among the respondents was 67%, with a median performance of 65%. The standard deviation in academic performance was observed to be 0.8. The range of academic performance within the sample was 33%, indicating a diversity in academic outcomes. The highest academic performance recorded was 87%, while the lowest was 54%. The distribution of the respondents' academic performance data exhibited a positive skewness of 0.52, indicating that a majority of the students scored above the mean academic performance.

4.2 Pearson's correlation result on dependent and independent variables

In applying Pearson's correlation analysis, it is imperative to ascertain statistically significant results. This significance implies a high degree of confidence that the observed results are not attributable to chance or sampling errors. The two-tailed significance level should exceed $p>0.05$ for the results to be deemed statistically significant. In this study, Pearson's product-moment correlation was utilised to determine whether a statistically significant correlation existed between the academic performance of quantity surveying students (as the dependent variable) and their adaptive flexibility (as the independent variable).

Table 3 and Figure 4 present the two-tailed statistical significance and the Pearson correlation coefficient among these variables. The analysis revealed a correlation coefficient of -0.283 between respondents' learning flexibility and academic performance, suggesting a small negative correlation. This implies that higher levels of learning flexibility were associated with lower academic performance. These findings suggest that while ideally, learners integrating various learning styles to capitalise on the strengths of each might be beneficial, it does not necessarily translate into improved academic performance.

Table 3: Pearson's product-moment correlation test

	Flexibility
Pearson correlation	-0.283
Sig. (2-tailed)	0.016
N	72
Explained variation in dependent variable	8%

The negative correlation between respondents' learning flexibility and academic performance was found to be statistically significant. Moreover, as shown in Table 3 and Figure 4, learning flexibility accounted for 8% of the variation in academic performance. This 8% variation represents the extent to which learning flexibility contributes to the variance or dispersion observed in the respondents' academic performance.

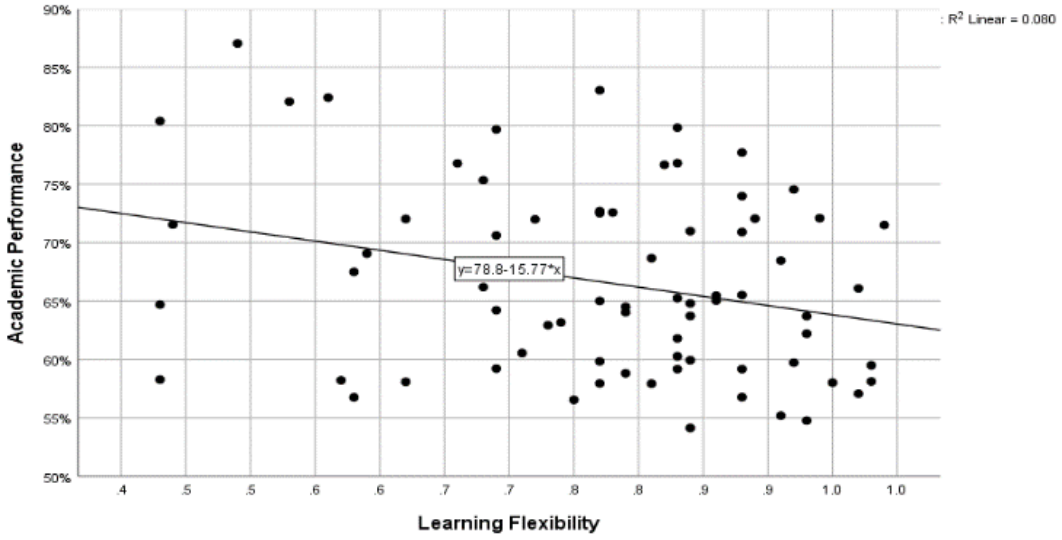

Figure 4. Correlation between respondents' learning flexibility and academic performance

5. CONCLUSION AND RECOMMENDATION

Quantity surveying (QS) education and research have historically overlooked the correlation between QS students' experiential learning style preferences and their academic performance, with limited studies conducted in this domain. This study revealed that the assimilating learning style was predominant among the respondents, characterised by a preference for abstract concepts and theoretical model exploration. These students demonstrated proficiency in logically processing extensive information. However, the research did not find a statistically significant difference in academic performance across the five identified learning style groups, indicating that no specific learning style is associated with enhanced academic performance. This finding suggests that students' learning styles do not significantly impact their academic performance and should not be used as a predictive criterion.

Additional observations from this study include: 1) QS students displayed a relatively high level of adaptive flexibility, indicating ease in transitioning between different learning modes and adaptability to various learning scenarios; and 2) a weak negative correlation was observed between adaptive flexibility and academic performance, suggesting that students with higher adaptive flexibility may experience lower academic success. This suggests that while adaptive flexibility can facilitate a deeper understanding of academic content, it does not necessarily result in higher academic performance.

The study emphasises the continuous interaction between an individual's personal experience and the learning process. It concludes that personal experiences are intrinsic to all learning and must be transformed through a learning cycle that fosters deeper learning by building upon past experiences. This underscores the importance of individualism in the learning process, where personal experiences and their transformation play a critical role in defining learning styles.

Recommendations for learners include a reflective approach towards their learning methods and participation in the learning cycle. Therefore, QS students should undertake learning style assessments to identify their preferred learning styles and adaptive flexibility. Understanding their learning identity allows students to recognise their strengths and weaknesses, providing a foundation for learning in any situation. Developing 'back-up'

learning styles is also recommended to enhance learning flexibility, which is crucial for adapting to diverse academic tasks and promoting deeper learning.

For lecturers, it is advisable to understand students' learning preferences and engage them in a variety of learning activities that strengthen their abilities and address their weaknesses. Implementing Kolb's learning cycle as a teaching framework encourages students to develop unfamiliar learning style skills and strategies. If executed effectively, this approach can expand students' learning flexibility. Additionally, adopting Kolb's teaching role profile can help educators tailor their teaching methods to accommodate every learning style. Therefore, QS departments at tertiary institutions are encouraged to provide opportunities for lecturers to expand their understanding and application of the experiential learning cycle through workshops and online training.

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