Pak. j. life soc. Sci. (2024), 22(2): 21065-21078 E-ISSN: 2221-7630;P-ISSN: 1727-4915

Pakistan Journal of Life and Social Sciences
www.pjlss.edu.pk

https://doi.org/10.57239/PJLSS-2024-22.2.000202

RESEARCH ARTICLE

The Impact of Cognitive Flexibility on Navigating Personality and Learning Style Differences in Higher Education

Yusfarizal Bin Yussoff[1*], Shahrul Mizan Ismail (PhD)[2], Nabeel Mahdi Althabhawi[3]

[1] Messrs Yusfarizal Aziz & Zaid, Advocates & Solicitors

[2,3] Universiti Kebangsaan Malaysia (UKM)

ARTICLE INFO

Received: Oct 18, 2024

Accepted: Dec 22, 2024

Keywords

Cognitive Flexibility

Navigating Personality

Learning Style

Higher Education

ABSTRACT

This research explores the moderating role of cognitive flexibility in the interaction between MBTI personality traits and VARK learning styles, offering new insights into adaptability in academic settings. Using data from 77 university students, the study demonstrates that students who develop higher cognitive flexibility perform better even when instructional strategies do not align with their personality traits or preferred learning styles. The findings show that introverted learners successfully engage in collaborative tasks through reflective strategies, while extroverted learners adapt to solitary assignments by creating accountability structures. This study proposes multimodal teaching practices, reflective exercises, and adaptive learning platforms as essential tools to foster cognitive flexibility, ensuring students develop resilience and thrive across varied learning environments.

***Corresponding Author:**

kahfiashabul432@gmail.com

INTRODUCTION

The landscape of higher education in Malaysia is evolving rapidly, with the rise of online, blended, and multimodal learning formats that require students to adapt to diverse instructional environments. Traditional teaching methods that align strictly with students' personality traits and learning styles are increasingly being challenged, as the modern educational environment demands greater cognitive flexibility, the capacity to modify thoughts and behaviors to navigate unfamiliar or changing circumstances (Farrington et al., 2019). This ability is becoming essential in the context of higher education, where students must balance independent learning, group collaboration, and hands-on practical work to meet academic demands.

Personality traits and learning preferences have long been recognized as key determinants of academic success. The MBTI personality framework provides a lens through which students' tendencies, behaviors, and reactions to academic tasks can be understood. For example, introverted students generally excel in independent study environments, while extroverted students thrive in collaborative activities that involve discussion and teamwork (Jesús Maya et al., 2021). Similarly, the VARK model helps educators categorize students into visual, auditory, kinesthetic, or reading/writing learners, based on their preferred modes of processing information (Fleming, 2001). However, these frameworks, while helpful, tend to oversimplify the learning process by assuming that students remain fixed in their behaviors and preferences over time (Pashler et al., 2008).

This rigidity presents challenges in modern education, as students are often required to engage in tasks that may not align with their personality or preferred learning style. For example, a kinesthetic learner may find themselves struggling in theory-based courses, while a strongly introverted student

may feel overwhelmed by the social demands of group projects. In these cases, cognitive flexibility i.e the ability to shift between different ways of thinking and interacting with content, plays a critical role in ensuring students remain engaged and successful. Cognitive flexibility allows students to move beyond their comfort zones, adopting new strategies and behaviors to perform effectively even in unfavorable or mismatched learning environments (Vedel, 2014).

Developing cognitive flexibility requires more than just exposing students to multiple instructional formats; it involves fostering the skills and mindsets necessary for adaptation and resilience. Research has shown that students with high cognitive flexibility are better equipped to adjust their learning strategies and maintain motivation, even in stressful or unpredictable situations (Jesús Maya et al., 2021). Instructors must therefore design courses that not only align with students' dominant traits and preferences but also provide opportunities for experimentation and adaptation, enabling students to expand their repertoire of learning strategies over time (Farrington et al., 2019).

The rise of adaptive learning technologies further underscores the importance of promoting cognitive flexibility in education. Modern digital platforms such as Moodle and Microsoft Teams enable instructors to create personalized learning paths, offering students tailored feedback and opportunities for reflection. These platforms allow for the integration of multiple learning modes, ensuring that students are continuously exposed to varied instructional styles (Pashler et al., 2008). At the same time, gamified elements within these platforms, such as quizzes, leaderboards, and interactive simulations, encourage students to experiment with new ways of engaging with content, building the skills necessary for long-term academic success.

The focus of this research is to reframe the interplay between personality traits and learning styles through the lens of cognitive flexibility, offering a new perspective on how students navigate mismatched instructional environments. While previous studies have explored the influence of personality and learning preferences on academic performance, few have examined the dynamic processes of adaptation that allow students to succeed despite these differences. This study aims to fill that gap by investigating how cognitive flexibility moderates the relationship between personality traits, learning preferences, and academic outcomes, providing actionable insights for educators seeking to promote adaptive learning.

In sum, this research argues that while aligning teaching strategies with students' traits and preferences can improve engagement, it is cognitive flexibility that ensures long-term academic resilience. By fostering adaptability, instructors can empower students to excel across varied learning environments, preparing them not only for academic success but also for the complex challenges of the modern workforce.

Problem statement and research objectives

Problem statement

In higher education, achieving academic success depends not only on students' innate abilities but also on how effectively teaching strategies align with their individual traits and learning preferences. Personality models like the MBTI framework provide a structured way to understand students' behaviors and tendencies, distinguishing between introverted and extroverted learners and their varying responses to academic environments (De Feyter et al., 2012). Similarly, the VARK model categorizes learners by how they best process information, namely, visually, auditorily, through reading/writing, or kinesthetically (Fleming, 2001). However, while these frameworks provide valuable insights, they also risk oversimplifying learning processes by locking students into rigid patterns that may not reflect their full potential.

One of the most persistent challenges in education arises when students are confronted with instructional methods that do not align with their dominant personality traits or learning styles. For example, visual learners might struggle to stay engaged in discussion-based courses, while introverted students may experience discomfort and stress in highly interactive group projects (Pashler et al., 2008). Research indicates that such mismatches can result in frustration, disengagement, and decreased academic performance, especially for students who are unable to adapt their strategies to meet the demands of unfamiliar tasks (Jesús Maya et al., 2021).

Existing teaching models often encourage instructors to adapt their methods to students' preferences, assuming that better alignment between traits, learning styles, and teaching strategies will enhance performance (Fleming, 2001). While alignment can improve engagement, the educational landscape today is characterized by hybrid learning environments, group projects, and experiential courses, requires a more flexible approach. Simply matching instructional methods to learning styles may create dependency, preventing students from developing the adaptability needed to excel in varied and dynamic learning environments (Pashler et al., 2008).

This underscores the need to develop cognitive flexibility, an essential skill that allows students to modify their behaviors, thoughts, and strategies in response to changing academic contexts. Students with high cognitive flexibility can move between different learning modes and perform well even when instructional formats do not align with their preferences (Vedel, 2014). However, many students struggle with adaptability, particularly when they encounter unfamiliar challenges that require them to move beyond their comfort zones (Farrington et al., 2019). Without deliberate efforts to foster this adaptability, students may become disengaged, leading to academic underperformance and higher dropout rates.

Despite the critical importance of cognitive flexibility, limited research exists on how it interacts with personality traits and learning styles to shape academic outcomes. Most studies on personality and learning styles treat these traits as static, focusing on how students behave within aligned environments rather than exploring how they adapt to mismatched conditions (Jesús Maya et al., 2021). This research seeks to fill that gap by investigating the moderating role of cognitive flexibility, offering insights into how adaptability can promote long-term academic resilience and success.

Research objectives

In light of the problem identified, this research aims to reframe the relationship between personality traits, learning styles, and academic performance through the lens of cognitive flexibility. The goal is to provide a deeper understanding of how adaptability enables students to thrive, even when faced with instructional methods that do not align with their dominant traits or learning preferences. The following objectives guide this study:

1. **To explore the influence of cognitive flexibility on students' engagement and academic performance:** This objective seeks to determine how students with higher cognitive flexibility maintain engagement across diverse learning environments, even when they encounter tasks that challenge their personality traits or learning preferences.
2. **To investigate how cognitive flexibility moderates mismatches between personality traits, learning styles, and instructional strategies:** This objective focuses on understanding how students adapt when confronted with tasks that require them to engage outside their comfort zones. The aim is to identify whether adaptability can reduce frustration and enhance performance in mismatched environments.
3. **To identify teaching practices that promote cognitive flexibility and adaptive learning behaviors:** This objective aims to develop practical recommendations for instructors on how to design courses that foster cognitive flexibility. It explores the effectiveness of multimodal teaching strategies, real-time feedback systems, and reflective exercises in promoting adaptability.
4. **To assess the impact of adaptive learning technologies on students' cognitive flexibility:** Given the increasing use of digital platforms and gamified learning tools, this objective explores how technology can support students in developing cognitive flexibility. It focuses on whether features such as personalized learning paths, interactive simulations, and collaborative activities enhance adaptability.

By pursuing these objectives, this research aims to provide actionable insights for educators seeking to foster resilience and adaptability in their students, ensuring they are prepared to navigate the complex and ever-changing demands of modern education.

2. LITERATURE REVIEW

This section explores the major frameworks and theories relevant to the study, focusing on the interaction of MBTI personality traits, VARK learning styles, and cognitive flexibility. In reviewing prior studies, this section also identifies gaps that limit our current understanding of how students develop adaptive learning behaviors when instructional strategies do not align with their dominant traits or preferences.

Personality traits and academic performance

Personality traits have long been recognized as key factors in shaping academic behaviors, motivation, and outcomes. One of the most widely used personality frameworks is the Myers-Briggs Type Indicator (MBTI). The MBTI identifies four dichotomous pairs: introversion (I) vs. extroversion (E), sensing (S) vs. intuition (N), thinking (T) vs. feeling (F), and judging (J) vs. perceiving (P) (Vedel, 2014). Each student is classified into one of 16 personality types, which helps explain their approach to learning, task engagement, and interaction with peers.

Research shows that personality traits are predictive of academic success. Introverted students tend to excel in solitary and self-paced environments, performing well in reflective writing and deep-reading tasks. On the other hand, extroverted learners thrive in interactive environments, where they can actively engage with peers through group projects or discussions (De Feyter et al., 2012). Further studies have found that judging types prefer highly structured academic environments with clear deadlines, while perceiving types excel when given creative freedom and open-ended assignments (McCrae & Costa, 2010). These insights highlight the importance of matching teaching styles with personality traits to enhance student engagement.

However, the challenge lies in the fact that students rarely conform neatly to one set of preferences throughout their academic journey. Personality traits, while useful predictors, do not account for situational variability—that is, students may behave differently depending on task demands or external pressures (Farrington et al., 2019). Thus, relying solely on personality-based approaches can reinforce fixed learning behaviors, reducing students' capacity to develop the adaptability needed to excel in varied academic settings (Jesús Maya et al., 2021).

Learning styles and their impact on engagement

The VARK learning model, which categorizes students as visual, auditory, reading/writing, or kinesthetic learners—has been widely adopted in educational settings to better align teaching strategies with students' preferences (Fleming, 2001). Each learning style reflects a specific way in which students process information most effectively:

- Visual learners prefer diagrams, charts, and videos, excelling when content is presented graphically.
- Auditory learners thrive in lectures and discussions, benefiting from opportunities to engage with verbal content.
- Reading/Writing learners excel when provided with text-based materials, such as articles, books, or handouts.
- Kinesthetic learners perform best in hands-on tasks, including laboratory work, role-playing, and experiential activities.

Research indicates that aligning teaching strategies with students' learning styles can enhance their engagement and academic performance (Pashler et al., 2008). For example, visual learners demonstrate better comprehension when lessons include visual aids, while auditory learners retain more information through discussions and verbal explanations. Despite these advantages, critics argue that rigidly adhering to learning styles can limit students' capacity to engage with other modes of learning (Cuevas, 2015). This inflexibility creates dependency, reducing the likelihood that students will adapt effectively when exposed to unfamiliar instructional methods.

The role of cognitive flexibility in overcoming mismatches

Cognitive flexibility, defined as the ability to shift cognitive strategies and behaviors in response to new or changing situations, plays a crucial role in academic success (Martin & Rubin, 1995). In

contrast to personality traits and learning styles, which are often treated as fixed characteristics, cognitive flexibility reflects a dynamic skill that enables students to adapt to various instructional environments.

Research shows that students with high cognitive flexibility are more likely to maintain motivation and performance even when faced with instructional methods that do not align with their dominant traits or learning preferences (Jesús Maya et al., 2021). For example, kinesthetic learners who exhibit cognitive flexibility can succeed in lecture-heavy courses by developing note-taking skills, while introverted students can thrive in collaborative settings by assuming reflective or facilitative roles within a group (Farrington et al., 2019).

Cognitive flexibility is particularly relevant in the context of blended learning environments, where students must navigate both synchronous and asynchronous activities. In these settings, students benefit from the ability to switch between independent study and group collaboration, developing multimodal learning strategies that enhance their academic outcomes (McClelland et al., 2015). However, many students struggle with adaptability, particularly when teaching strategies are rigidly aligned with specific learning styles or personality traits (Pashler et al., 2008).

Interaction between personality, learning styles, and adaptability

While the MBTI and VARK frameworks offer useful insights into students' behaviors, both models have limitations when applied in isolation. A growing body of research highlights the importance of considering the interplay between personality, learning preferences, and adaptability. For example, extroverted students who prefer group work may experience frustration when required to complete independent assignments. However, students with high cognitive flexibility can develop strategies to succeed in unfamiliar environments, such as breaking large tasks into smaller, manageable chunks or seeking external feedback (Vedel, 2014).

Similarly, visual learners who typically rely on diagrams and images can benefit from learning auditory processing techniques, such as active listening and summarization, to perform well in discussion-based courses (Cuevas, 2015). Encouraging students to engage outside their comfort zones not only enhances academic performance but also promotes lifelong learning skills, preparing them for the demands of the workforce.

The interaction between personality, learning styles, and adaptability underscores the need for adaptive teaching strategies. Instructors must design courses that expose students to a variety of learning modalities, ensuring they develop the skills necessary to engage across different contexts (Jesús Maya et al., 2021). This approach fosters resilience, equipping students with the tools they need to succeed in both academic and professional settings.

Research gap and theoretical implications

While significant research has explored the influence of personality traits and learning styles on academic outcomes, relatively few studies have examined how cognitive flexibility moderates these relationships. Most studies focus on alignment between teaching strategies and students' traits or preferences, without investigating how students adapt when faced with instructional mismatches (Pashler et al., 2008). This creates a gap in understanding the dynamic processes of adaptation and growth that underlie successful academic performance.

This research aims to address this gap by examining the moderating role of cognitive flexibility in the relationship between personality traits, learning styles, and academic engagement. By focusing on how students navigate mismatched instructional environments, this study provides valuable insights into fostering adaptability and resilience in higher education.

3. RESEARCH METHODOLOGY

This section details the precise methods used to investigate cognitive flexibility, personality traits, and learning styles among a homogeneous sample of second-year law students. It outlines the study design, instruments used, participant sampling strategy, and data collection and analysis processes in an explicit, structured manner.

Research design

The study utilizes a concurrent mixed-methods research design to investigate the dynamic relationship between MBTI personality traits, VARK learning styles, and cognitive flexibility. This design allows for the simultaneous collection of quantitative and qualitative data, enhancing the validity and depth of the findings (Creswell & Plano Clark, 2017). The goal is to analyze how second-year law students adapt to instructional environments that may not align with their dominant traits and learning preferences and identify which factors contribute to academic success.

Law education, which demands both practical engagement (moot courts, discussions) and theoretical learning (case analysis, research papers), provides a rich context for studying cognitive adaptability. The mixed-methods approach ensures that the findings account for both numerical patterns (performance data) and experiential insights (interview narratives).

Participant selection and sampling strategy

A homogeneous sample of 77 second-year law students was selected to ensure consistency across the study. Second-year law students are ideal participants as they face increasingly challenging tasks, including mooting, case studies, legal research projects, and group-based assignments. Their academic workload demands both independent study and collaborative work, making them suitable for exploring how cognitive flexibility influences performance across instructional formats.

Participant demographics

- All participants were enrolled in the same law program at a public university, ensuring that the curriculum, learning environment, and academic expectations were consistent across the sample.
- Equal representation of gender and diverse socioeconomic backgrounds ensured that results were not biased by demographic factors.
- The participants were screened using both the MBTI and VARK assessments to ensure a balanced distribution across personality traits and learning preferences.

This sampling strategy employs purposive selection, choosing second-year law students due to their unique academic experience and voluntary participation, with students signing informed consent forms prior to data collection (McClelland et al., 2015).

Instruments and measures

The following instruments were used to gather data on personality traits, learning preferences, cognitive flexibility, and academic performance:

1. **MBTI personality assessment:** The MBTI framework categorized students into 16 personality types. This helped the research identify how behavioral tendencies, such as introversion or extroversion, impacted academic performance in both independent and group-based assignments (Vedel, 2014).
2. **VARK learning styles questionnaire:** This tool categorized participants into visual, auditory, reading/writing, and kinesthetic learners. Law students typically are accustomed to text-heavy material, and were assessed to explore how their preferred learning styles influenced engagement and adaptability (Fleming, 2001).
3. **Cognitive flexibility inventory (CFI):** The CFI, developed by Martin and Rubin (1995), was employed to assess participants' ability to adapt learning strategies to meet changing academic demands. The results classified students into high, moderate, and low cognitive flexibility groups.
4. **Academic performance metrics:** Student performance was evaluated through grades from research papers, exam results, participation in moot court exercises, and group projects. These metrics ensured a comprehensive assessment of how well students adapted to both theoretical and practical tasks.

Data collection procedures

The study took place over one academic semester, involving multiple stages of data collection:

1. **Baseline assessments:** In Weeks 1 and 2, participants completed the MBTI and VARK assessments. These initial tests provided a foundation for understanding the students' personality traits and learning preferences.
2. **Cognitive flexibility surveys:** The CFI was administered in Weeks 3 and 10 to capture any changes in adaptability during the semester. This two-point measurement ensured that cognitive flexibility development over time was recorded.
3. **Performance monitoring:** Throughout the semester, academic grades from independent and group-based assignments were collected, along with scores from moot court competitions. These performance metrics allowed for comparative analyses across tasks that required different skill sets.
4. **Focus group interviews:** At the end of the semester, focus group interviews were conducted with volunteer participants. These sessions provided qualitative insights into how students adapted to instructional mismatches and what strategies they employed to overcome challenges.

Data analysis techniques

Quantitative analysis

Quantitative data were analyzed using multiple regression models to examine the relationships between cognitive flexibility, personality traits, learning preferences, and academic performance. This statistical approach determined the extent to which cognitive flexibility influenced outcomes across varied instructional tasks (Cuevas, 2015).

Additionally, ANOVA tests were used to assess whether significant differences existed in performance among students with high, moderate, and low cognitive flexibility. This allowed for a clearer understanding of how adaptability levels impacted success in different academic settings.

Qualitative analysis

The qualitative data from the focus group interviews were analyzed using thematic coding (Braun & Clarke, 2006). Recurring themes related to engagement, frustration, adaptability, and motivation were identified, offering insights into the emotional and cognitive processes students employed to handle mismatches between their traits and instructional methods. This thematic analysis added depth to the quantitative findings, providing a more holistic understanding of students' experiences.

Why use ANOVA instead of a T-Test in this study?

ANOVA (Analysis of Variance) is more appropriate than a t-test in this case due to the structure and scope of the data. Below is a detailed justification for using ANOVA to analyze the relationship between MBTI personality traits, VARK learning styles, cognitive flexibility, and academic performance.

1. Comparing multiple groups simultaneously

The t-test is limited to two-group comparisons (e.g., comparing performance between two personality traits). However, this study involves comparing more than two groups:

- Multiple MBTI categories (e.g., introverts, extroverts, thinkers, feelers).
- Four VARK learning styles (visual, auditory, reading/writing, kinesthetic).
- Three levels of cognitive flexibility (low, moderate, high).

Since each independent variable has more than two levels or categories, ANOVA is necessary to compare these multiple groups simultaneously (Cohen, 2013). Using a t-test for every possible pair of comparisons would increase the risk of Type I errors (false positives), which occur when the number of tests performed increases.

2. Analyzing the interaction between factors

This study investigates how multiple independent variables interact—specifically, how personality traits, learning styles, and cognitive flexibility together influence academic performance.

- Two-way or three-way ANOVA can detect interactions between independent variables, such as whether cognitive flexibility affects performance differently based on personality type or learning style.
- A t-test, by contrast, cannot analyze interaction effects. It is only capable of determining differences between two groups on a single factor.

For example, if we want to determine whether extroverted students with high cognitive flexibility perform better than their introverted counterparts, ANOVA is essential to test this multi-level interaction (Creswell & Plano Clark, 2017).

3. Control over error rates

ANOVA helps maintain statistical rigor by controlling the family-wise error rate (the probability of making at least one false positive when conducting multiple tests). Running multiple t-tests across several groups would increase this error rate. ANOVA conducts a single test to compare all groups at once, reducing the chances of inflating Type I error (Pashler et al., 2008).

If the ANOVA yields significant results, post hoc tests (such as Tukey's HSD) can be used to determine exactly which groups differ. This two-step process ensures precision and accuracy.

4. Examining variance within and between groups

ANOVA not only compares group means but also examines variance within and between groups. This is particularly important for this study, as it explores whether performance differences are due to instructional mismatches (between-group variance) or individual adaptability (within-group variance). A t-test does not provide this level of analysis, making ANOVA the more appropriate choice for identifying patterns and variability in complex datasets (Martin & Rubin, 1995).

5. Example application in this study

- Independent variables:
    - MBTI personality types (e.g., introversion, extroversion)
    - Learning styles (visual, auditory, reading/writing, kinesthetic)
    - Cognitive flexibility levels (low, moderate, high)
- Dependent variable: Academic performance (e.g., assignment scores, moot court results, exam grades)

In this setup, ANOVA is essential to determine whether cognitive flexibility impacts performance differently based on the intersection of personality traits and learning styles. A t-test could only analyze one dimension at a time, failing to capture these complex interactions.

4. RESEARCH FINDINGS

This section presents the quantitative and qualitative findings from the study, examining the interaction between MBTI personality traits, VARK learning styles, cognitive flexibility, and academic performance among second-year law students. The data demonstrate the significance of cognitive flexibility in moderating instructional mismatches, revealing patterns in how students adapt to both collaborative and independent learning tasks. Each finding is discussed in detail, with evidence from statistical tests and thematic coding of qualitative interviews.

Academic performance across personality traits

The analysis indicates that students with different personality traits performed distinctively across various academic tasks.

- Introverted students excelled in independent assignments, including legal research and written case analyses, where they could work without time pressure or external interaction

(De Feyter et al., 2012). Their ability to reflect deeply on the material correlated with higher performance in case study assignments, where analytical precision is critical.

- Extroverted students, in contrast, performed better in moot court competitions and group projects, demonstrating an aptitude for verbal argumentation, discussion, and collaborative work (Jesús Maya et al., 2021). However, their scores in individual research assignments were slightly lower, suggesting that tasks requiring solitary focus were more challenging for them.

Judging types, i.e those who prefer structured environments, tended to achieve higher grades in assignments with clear deadlines and well-defined objectives, such as case summaries and take-home exams. On the other hand, perceiving types, who are more comfortable with flexibility, excelled in open-ended tasks like moots and debates, where creativity and spontaneity were rewarded (Vedel, 2014).

The differences in academic performance based on personality traits suggest that law students are more likely to succeed when their task demands align with their inherent behavioral tendencies. However, these findings also highlight the need for students to develop adaptability to ensure consistent performance across all types of tasks.

Engagement patterns by learning style

The findings indicate that students' learning preferences (as measured by the VARK model) influenced their engagement across different instructional contexts.

- Visual learners showed greater engagement during lectures that incorporated diagrams, flowcharts, and visual aids, particularly in courses like tort law, where complex legal concepts were simplified visually. However, their performance dipped in discussion-heavy environments, where information was conveyed verbally without visual reinforcement (Fleming, 2001).
- Auditory learners excelled in discussion-based activities and moots, benefiting from the verbal exchange of ideas. These students demonstrated strong comprehension in oral exams but reported struggling with text-heavy reading assignments that lacked verbal interaction.
- Reading/writing learners performed well across research-based tasks and written exams, reflecting their comfort with processing information through text. However, their engagement dropped in interactive group activities, where verbal and experiential learning dominated.
- Kinesthetic learners thrived in experiential tasks such as mock trials and moot court competitions, where they could learn by doing. Their engagement was notably higher during workshops and practical activities but decreased in traditional lecture settings (Jesús Maya et al., 2021).

These results suggest that students are more engaged and perform better when instructional strategies align with their dominant learning styles. However, the data also indicate that over-reliance on a single learning modality can limit academic flexibility.

Impact of cognitive flexibility on performance and adaptability

Cognitive flexibility emerged as a key moderator in the relationship between personality traits, learning styles, and academic performance. Students with high cognitive flexibility consistently performed well across all instructional contexts, regardless of whether the tasks aligned with their personality traits or learning styles (Martin & Rubin, 1995).

- For example, introverted students with high cognitive flexibility adapted effectively to collaborative tasks by taking on roles that suited their reflective nature, such as note-taking or coordinating discussions. This ability to contribute meaningfully without direct verbal interaction allowed them to succeed in group projects.

- Similarly, visual learners with high cognitive flexibility adapted to auditory environments by developing active listening skills and taking detailed notes, ensuring they remained engaged even without visual aids.

In contrast, students with low cognitive flexibility reported higher levels of frustration and disengagement when faced with instructional mismatches. Extroverted students with low flexibility struggled in independent research tasks, often procrastinating or seeking external validation, which resulted in lower performance. Reading/writing learners with low flexibility reported difficulty participating in experiential tasks, where they could not rely on text-based resources.

Statistical analysis of performance data

The ANOVA results revealed significant differences in performance across cognitive flexibility groups ($F = 8.47$, $p < 0.01$). Students with high cognitive flexibility scored higher on average across independent assignments, group projects, and moots, confirming the hypothesis that adaptability enhances performance in varied instructional environments.

- Post hoc tests indicated that the performance gap between students with high and low cognitive flexibility was most pronounced in moot court competitions, where adaptability was critical to responding to opposing arguments on the spot.

Additionally, the interaction effects between personality traits, learning styles, and cognitive flexibility were significant ($p < 0.05$). For example, extroverted students with high cognitive flexibility outperformed introverted peers in group-based tasks, but the difference in performance disappeared when the task was a solitary research assignment.

5.5 Qualitative insights from focus group interviews

The focus group interviews provided valuable insights into students' experiences with instructional mismatches and how they developed adaptability. Students frequently mentioned the role of peer support in overcoming challenges, particularly in group projects. Introverted students reported that they initially felt overwhelmed by the social demands of moot courts but gradually adapted by practicing their arguments privately before participating.

One student noted:

"At first, I dreaded the thought of having to argue in front of others, but I found that preparing in advance and focusing on one key point helped me feel more confident."

Similarly, auditory learners described feeling "lost" during text-heavy assignments but learned to annotate readings and discuss the material with classmates to stay engaged. These examples illustrate the importance of cognitive flexibility in fostering resilience, allowing students to adapt to tasks that do not align with their natural preferences (Farrington et al., 2019).

Summary of findings

The findings confirm the importance of cognitive flexibility in navigating the demands of law education, where students are required to excel across both theoretical and practical tasks. Students with higher cognitive flexibility consistently outperformed their peers, demonstrating that adaptability is a critical factor in academic success.

These results suggest that educational interventions should focus on fostering cognitive flexibility by encouraging students to engage with multiple learning styles and instructional methods. Blended learning environments, reflective practices, and real-time feedback systems can further support students in developing the adaptability needed to thrive in diverse academic settings (Pashler et al., 2008).

Analysis of research findings.

This section offers a critical analysis of the findings, highlighting how cognitive flexibility serves as a moderator in the interaction between personality traits, learning styles, and academic performance. It further explores the theoretical implications of the study, addressing how the results align with or

challenge previous research. Additionally, the section considers the limitations of the study and provides practical recommendations for educational practice and future research.

Cognitive flexibility as a critical determinant of academic success

The findings emphasize the central role of cognitive flexibility in determining academic performance across different instructional contexts. Students with high cognitive flexibility consistently demonstrated better performance in both collaborative and independent tasks, supporting the argument that adaptability is essential in navigating diverse educational environments (Martin & Rubin, 1995). The ability to shift between learning strategies when needed allowed these students to excel even when their tasks did not align with their personality traits or learning styles.

Inconsistent alignment with instructional methods has been identified in previous studies as a common cause of academic failure (Pashler et al., 2008). However, the current study's findings suggest that students with high cognitive flexibility are less vulnerable to such instructional mismatches. This aligns with Jesús Maya et al. (2021), who argued that flexibility in learning enhances resilience, enabling students to overcome frustration and maintain motivation. The performance advantage observed among extroverted students with high cognitive flexibility in solitary tasks, such as legal research, demonstrates how adaptability allows individuals to function effectively outside their comfort zones.

Conversely, students with low cognitive flexibility struggled to adapt, performing poorly in tasks that required different learning strategies from their default mode. This suggests that a lack of cognitive flexibility acts as a barrier to academic success, especially when students are exposed to diverse learning modalities—a finding consistent with Vedel's (2014) research on the importance of adaptability for academic growth.

Personality traits and their impact on task performance

The personality traits identified by the MBTI provide insights into students' behavior across different types of assignments. Introverted students, for example, excelled in independent legal research, aligning with their preference for deep reflection and minimal social interaction (De Feyter et al., 2012). However, their success in group-based tasks, such as moot courts, depended heavily on their ability to adopt adaptive strategies, a finding that reinforces the need for students to engage beyond their dominant traits.

The results suggest that extroverted students thrive in tasks that require verbal interaction and collaboration, such as moot court competitions. However, their performance dip in individual research-based tasks reflects the limitations of relying solely on dominant personality traits. This supports the findings of McCrae and Costa (2010), who highlighted that while personality traits shape preferences, over-reliance on these traits without developing adaptability may hinder academic performance.

Learning styles: strengths and limitations

The VARK learning model provides useful insights into students' engagement with content but also exposes its limitations. Students who relied heavily on their dominant learning styles struggled when confronted with tasks that required different modes of engagement. For example, visual learners performed poorly in discussion-based activities, where auditory processing was essential. Similarly, kinesthetic learners found it difficult to stay motivated during lecture-heavy courses, despite their success in practical workshops.

The tendency to rely solely on a dominant learning style underscores the risk of rigid instructional strategies (Fleming, 2001). As Cuevas (2015) argued, rigid adherence to learning styles can create dependency, preventing students from developing the adaptability required to excel in varied educational settings. However, the findings also highlight the importance of encouraging multimodal learning strategies, allowing students to engage effectively across different instructional environments.

Interaction effects: cognitive flexibility as a buffer against mismatches

A key finding from the study is that cognitive flexibility serves as a buffer against mismatches between personality traits, learning styles, and instructional demands. This aligns with McClelland

et al. (2015), who emphasized that students with higher adaptability are better equipped to navigate environments that challenge their default learning patterns. For example, reading/writing learners with high cognitive flexibility reported success in experiential tasks by adapting their strategies—such as creating written outlines for hands-on activities.

The significant interaction effect between personality traits, learning styles, and cognitive flexibility suggests that adaptability is not merely an auxiliary skill but a core component of academic success. Students who demonstrated flexibility were able to transform perceived weaknesses into strengths, adapting their behavior to meet the demands of different tasks.

5. LIMITATIONS OF THE STUDY

While the findings provide valuable insights, there are some limitations to the study. First, the homogeneous sample of second-year law students limits the generalizability of the findings to other academic fields. Law students are exposed to a unique blend of theoretical and practical tasks, which may not reflect the experiences of students in other disciplines. Future research should explore whether the findings hold across STEM and humanities students, whose instructional environments differ significantly.

Second, the study relies on self-reported measures (MBTI and VARK), which may introduce bias or inaccuracies in the data. Although these tools are widely used, their effectiveness in capturing the complexities of personality and learning preferences remains debated (Pashler et al., 2008). Additionally, cognitive flexibility was assessed through a two-time-point survey, which may not fully capture the dynamic nature of adaptability over time. A longitudinal study would provide a more comprehensive understanding of how cognitive flexibility develops.

6. PRACTICAL IMPLICATIONS FOR EDUCATIONAL PRACTICE

The findings highlight the need for educational interventions that foster cognitive flexibility. Instructors should design courses that encourage students to engage with multiple learning modalities, moving beyond their dominant traits and preferences. For example, integrating blended learning environments, where students participate in both online and in-person tasks, can promote adaptability by requiring students to switch between different modes of engagement (Jesús Maya et al., 2021).

Additionally, reflective exercises, such as self-assessment journals can help students identify their strengths and weaknesses, encouraging them to experiment with new strategies. The use of adaptive learning platforms that provide real-time feedback tailored to students' needs can further support the development of cognitive flexibility.

7. THEORETICAL IMPLICATIONS AND FUTURE RESEARCH DIRECTIONS

The study contributes to the theoretical understanding of cognitive flexibility by demonstrating that it is not merely a supplementary skill but a core determinant of academic performance. The findings challenge the traditional assumption that instructional alignment is the key to success, suggesting instead that adaptability plays a more significant role.

Future research should explore how adaptive learning technologies, such as AI-powered platforms, can support the development of cognitive flexibility. Additionally, investigating how cultural and environmental factors influence the interaction between personality, learning preferences, and adaptability would provide valuable insights for global education.

8. CONCLUSION

The findings of this study unequivocally challenge the long-standing reliance on rigid instructional alignment with personality traits and learning styles, such as those identified by the MBTI and VARK models. While conventional educational paradigms emphasize that matching teaching strategies with individual preferences improves learning outcomes (Pashler et al., 2008; Fleming, 2001), this research highlights a more fundamental determinant of success: cognitive flexibility. Without the ability to adapt and perform across mismatched environments, students risk becoming prisoners of their dominant traits and preferences, locked into patterns that limit their academic and professional growth (Cuevas, 2015).

This study's results suggest that the education system's obsession with alignment has created fragile learners—students who perform well only when conditions are favorable. Such learners, unable to switch gears or adapt to diverse demands, are ill-prepared for the complexities of real-world challenges, where personal and professional contexts rarely align neatly with individual preferences (Jesús Maya et al., 2021). In contrast, the research underscores that students with high cognitive flexibility are better equipped to thrive, not just in the classroom but also in their future careers, where adaptability is increasingly regarded as a core competency (McClelland et al., 2015).

Educators and policymakers must come to terms with the limitations of the current paradigm, which treats personality and learning preferences as fixed determinants of success. Merely aligning teaching strategies with VARK learning styles or MBTI traits risks reinforcing cognitive laziness, discouraging students from developing the essential ability to think beyond their comfort zones (Farrington et al., 2019). The coddling effect of such alignment fosters dependency, leaving students vulnerable when they encounter environments that challenge their preferences.

It is, therefore, provocative but necessary to argue that teachers who rely too heavily on these models may be doing more harm than good. Instead of helping students succeed, they may inadvertently cultivate fragility and rigidity, creating graduates who lack the resilience to navigate the complex, fluid challenges of the modern world. This critique is not just an indictment of classroom practices but a call to rethink educational design from the ground up. Adaptive learning technologies, multimodal teaching approaches, and reflective practices must replace outdated, fixed notions of instruction if students are to develop into adaptable, lifelong learners.

The evidence presented here points toward a radical shift in educational priorities: success in education today is no longer about alignment; it is about adaptability. Cognitive flexibility is the bridge between theory and practice, personality and performance, preference and achievement. Future research and educational practices must focus on cultivating this flexibility, ensuring that students are prepared not just to survive but to thrive in environments of constant change and unpredictability.

In conclusion, this study invites educators, institutions, and policymakers to embrace a provocative yet necessary truth: the future of education lies not in molding environments to suit students' traits, but in equipping students to adapt to the inevitable mismatches they will encounter. Those who cling to traditional models will be left behind, while those who champion cognitive flexibility will forge a path toward lasting success—both inside and beyond the classroom.

REFERENCES

1. Cohen, J. (2013). Statistical power analysis for the behavioral sciences. Routledge.
   - This book offers foundational insights into statistical methods, including the rationale behind ANOVA, which was relevant to the data analysis in this study.
2. Creswell, J. W., & Plano Clark, V. L. (2017). Designing and conducting mixed methods research. Sage Publications.
   - This text provided the framework for the mixed-methods approach used to integrate quantitative and qualitative data.
3. Cuevas, J. (2015). Is learning styles-based instruction effective? A comprehensive analysis of recent research on learning styles. Theory and Research in Education, 13(3), 308-333. https://doi.org/10.1177/1477878515606621
   - Cuevas' work critiques the learning styles framework, emphasizing the limitations of rigid instructional alignment—a key argument in the study.
4. De Feyter, T., Caers, R., Vigna, C., & Berings, D. (2012). Unraveling the impact of the Big Five personality traits on academic performance: The moderating and mediating effects of self-efficacy and academic motivation. Learning and Individual Differences, 22(4), 439-448.
   - This article provided insights into the role of personality traits in academic success, complementing the study's analysis of MBTI personality types.

5. Farrington, C. A., et al. (2019). Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance. Consortium on Chicago School Research.
   - Farrington's research supports the study's focus on cognitive flexibility and adaptability in educational outcomes.
6. Fleming, N. D. (2001). Teaching and learning styles: VARK strategies (3rd ed.). Christchurch, New Zealand: N.D. Fleming.
   - Fleming's VARK model formed the basis for assessing students' learning preferences in the study.
7. Jesús Maya, J. F., et al. (2021). The relationship between learning styles and academic performance: Consistency among multiple assessment methods. Sustainability, 13(6), 3341.
   - This paper provided evidence on how learning preferences influence performance, supporting the study's focus on mismatches and adaptability.
8. Martin, M. M., & Rubin, R. B. (1995). A new measure of cognitive flexibility. Psychological Reports, 76(2), 623-626.
   - This article introduced the Cognitive Flexibility Inventory (CFI), which was used in the study to assess students' adaptability.
9. McClelland, M. M., Tominey, S. L., Schmitt, S. A., & Duncan, R. (2015). Reducing disruptive behavior through cognitive flexibility: A targeted approach. Early Childhood Research Quarterly, 30(1), 128-139.
   - McClelland's work on cognitive flexibility provided theoretical support for the study's emphasis on adaptability as a core competency.
10. McCrae, R. R., & Costa, P. T. (2010). Personality in adulthood: A five-factor theory perspective. Guilford Press.
- This book offers a deeper understanding of personality traits, enriching the study's analysis of how MBTI dimensions influence performance.
11. Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2008). Learning styles: Concepts and evidence. Psychological Science in the Public Interest, 9(3), 105-119.
- This paper provided a critical review of learning styles theories, supporting the study's focus on cognitive flexibility over rigid instructional alignment.
12. Vedel, A. (2014). The Big Five and tertiary academic performance: A systematic review and meta-analysis. Personality and Individual Differences, 71, 66-76.
- Vedel's research offered insights into personality traits and academic outcomes, aligning with the study's focus on MBTI types.