



ORIGINAL RESEARCH PAPER

Education

FOSTERING PRUDENT LEARNING BEHAVIOUR AND ACADEMIC ACHIEVEMENT THROUGH VARK-BASED INSTRUCTION: A SURVEY OF EVIDENCE WITH AN INSTITUTIONAL ANALYSIS OF FACULTY LEARNING-STYLE PROFILES

KEY WORDS: VARK model; learning styles; prudent learning behaviour; self-regulated learning; teacher learning-style profile; multimodal instruction; academic achievement

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ABSTRACT

Learning-style analysis using Neil Fleming's Visual, Aural, Read/Write and Kinesthetic (VARK) inventory is widely used to understand how learners prefer to receive and process information, yet its instructional value is most often examined from the student side alone. This survey research article synthesises empirical evidence on VARK-based teaching and measurable student achievement, and extends the discussion by proposing that VARK awareness cultivates prudent, self-regulated learning behaviour alongside raising test scores. Fourteen peer-reviewed and indexed studies spanning primary, secondary, undergraduate and medical education contexts were reviewed, revealing consistent, though heterogeneous, achievement gains associated with VARK-informed instruction, ranging from an effect size of 0.16 to improvement rates above 33 percent. To ground the discussion institutionally, VARK scores from 32 teaching faculty of a single institution were analysed descriptively and correlationally. Aural preference was most frequently dominant (43.8% of faculty), followed by kinesthetic (28.1%), visual (21.9%) and read/write (15.6%), while the four modality scores correlated weakly with one another (all $|r| \leq 0.34$, $p > 0.05$), confirming their conceptual independence; over 40% of faculty showed near-tied top preferences, indicating a largely blended, multimodal disposition. These findings, read alongside the literature, suggest that deliberate instructional variety informed by VARK profiling, rather than rigid style-matching, supports both prudent learning-strategy decisions and improved academic outcomes. Implications for faculty development and directions for teacher-to-student outcome tracking are discussed.

INTRODUCTION

Individual differences in how learners prefer to receive, encode and retrieve information have long occupied educational researchers. Among the various learning-style frameworks, the Visual, Aural, Read/Write and Kinesthetic (VARK) model developed by Fleming and Mills (1992) remains one of the most widely applied, owing to its brevity, intuitive four-dimensional structure, and explicit design as a reflective catalyst rather than a rigid diagnostic label. The VARK questionnaire yields a numerical score for each modality, describing a learner or teacher not by a single fixed category but by a profile that may be strongly unimodal or broadly multimodal.

The practical appeal of VARK analysis lies in its promise of translating self-knowledge into more deliberate instructional and study choices. When a teacher or student becomes aware of a dominant processing channel, that awareness can be converted into judicious, evidence-informed decisions about how material is presented or study time is allocated, rather than the passive assumption that one style suffices for all purposes. This paper terms this capacity prudent learning behaviour: the judicious, self-regulated selection and adjustment of learning and teaching strategies in light of one's own and others' modality preferences, rather than rigid adherence to a single channel — a capacity closely related to metacognition and self-regulated learning, but anchored to the concrete decisions VARK profiling makes visible.

A substantial body of research has examined whether tailoring instruction to VARK-identified preferences improves measurable achievement, with generally positive but methodologically varied findings. A smaller strand has looked at teachers' own VARK profiles and how these might shape their instructional choices, and fewer studies still have examined how the four VARK dimensions relate to one another within a teaching population — a gap that matters because an institution designing faculty development needs to know both whether VARK-based teaching helps students, and what its own staff's modality profile looks like.

This article therefore pursues two linked aims: first, to synthesise recent literature on how VARK-informed teaching relates to measurable achievement and to prudent, self-directed learning behaviour; second, to report an institutional analysis of VARK scores from 32 teaching faculty, examining the distribution of modality scores, dominant versus blended profiles, and the statistical inter-relationship among the four dimensions. Together, these argue that VARK analysis

contributes most reliably to achievement not by matching instruction to fixed categories, but by promoting deliberate instructional variety and, correspondingly, prudent learning choices by both teacher and student.

Conceptual Framework: VARK Analysis, Prudent Learning, and Student Achievement

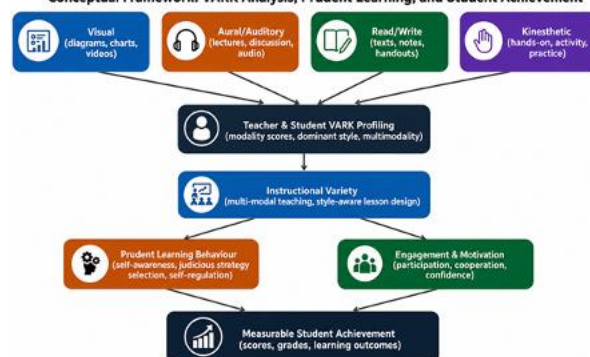


Figure 1. Conceptual framework linking VARK profiling, instructional variety, prudent learning behaviour and measurable student achievement.

2. Literature Review

2.1 VARK-Based Teaching and Measurable Achievement

Across diverse educational contexts, VARK-informed teaching interventions are associated with consistent gains in measurable achievement, although the magnitude varies. In an Iraqi study of fifth-grade science students, a group taught through study plans tailored to the VARK model outperformed a control group, yielding a moderate effect size of 0.16 (al-Tamimi & Musa, 2021). In a Thai study of first-year medical students, materials differentiated by modality — animations for visual learners, audio clips for aural learners, handouts for reading/writing learners, and structured exercises for kinesthetic learners — produced mean score improvements exceeding 33 percent from pre-test to post-test (Chinnapun & Narkkul, 2024). An Indonesian action-research study reported a mean score increase from 69.16 to 77.08 percent across two cycles after visual, auditory and kinesthetic elements were combined (Rosdiana et al., 2022). Comparable gains appear in undergraduate systems-analysis courses in Brazil (Silva et al., 2020) and multimedia-design courses in Thailand, where quadmodal (all four VARK dimensions) learners outperformed unimodal peers (Daoruang et al., 2019a, 2019b).

Two broadly distinct pedagogical strategies emerge from this literature: a matching approach, aligning materials to each

student's identified preference, and an integration approach, combining all four VARK elements within the same lesson regardless of preference. Evidence for their relative superiority is mixed but instructive. The Thai study found no significant difference in achievement gains across style groups despite a matching design, implying that rich, varied materials mattered more than precise alignment (Chinnapun & Narkkul, 2024). An Israeli primary-school study combining multiple VARK elements within short lesson segments across a full year found that all pupils benefited regardless of personal preference, that mismatched elements still increased motivation and perceived capability, and that the visual element benefited the whole cohort, including pupils with special educational needs (Avni, 2011). VARK-based teaching has also been linked to cooperation, learning interest and classroom participation (Rosdiana et al., 2022).

2.2 Student VARK Preferences and Achievement: A More Contested Picture

When the focus shifts to the simple correlation between a student's own VARK preference and achievement, evidence becomes less consistent. Some health-science and dental cohort studies report a modest association (Alhazmi et al., 2025; Shokrpour, 2024). Conversely, Malaysian polytechnic business students showed no significant achievement difference across VARK groups (Mahmood et al., 2017), and pre-service physical-education teachers showed no direct relationship between dominant style and overall achievement, though influence appeared among moderate achievers (Bulca & Demirhan, 2026). Bachelor of Elementary Education students, by contrast, showed a significant relationship (Luzano et al., 2024). This heterogeneity echoes an influential critique of the broader learning-styles literature, which found no credible support for the meshing hypothesis — that matching instructional mode to a preferred channel improves learning (Pashler et al., 2009; Nancekivell et al., 2020) — even though most teachers internationally still endorse it. VARK analysis is thus most defensible not as a device for sorting students into fixed lanes, but as a tool that raises awareness of the range of channels present in a classroom and motivates varied instruction.

2.3 Teaching Style, Learning Style, and the Match/Mismatch Question

A related strand asks whether alignment between a teacher's own instructional style and a student's preference affects outcomes. Reviews describe a genuinely divided field, with roughly equal numbers of studies favouring matching and mismatching (Gilakjani, 2012). Where compared directly, matched students showed higher mean achievement than mismatched peers, with audio-visual access as a facilitating condition (Bilal & Farooq, 2018), and pupils' performance has correlated with the specific teaching style a teacher adopts (Macalisang, 2024). Because a teacher's choices are shaped partly by their own preferred processing channel (Beck, cited in Gilakjani, 2012), an institution's aggregate teacher VARK profile is a legitimate, under-examined object of study. Overall, the literature suggests VARK-informed teaching reliably raises achievement when it increases instructional variety; that raw student-side correlations alone are inconsistent; and that the teacher's own profile plausibly shapes classroom variety yet is rarely analysed institutionally — the gap this article addresses.

3. METHODOLOGY

This article follows a survey research design combining a structured literature synthesis with a secondary quantitative analysis of institutionally collected VARK data, suited to establishing both the external evidence base and institution-specific grounding for practice recommendations.

3.1 Literature Search and Screening

A structured search was conducted across Scopus-indexed and other peer-reviewed sources, supplemented by a semantic search of Semantic Scholar and OpenAlex, using

terms combining "VARK", "learning style", "teaching style", "academic achievement" and "prudent/self-regulated learning". Studies were retained if they described a VARK-based teaching adaptation or empirical VARK-achievement association, reported a quantifiable achievement measure, occurred in a genuine educational setting, and presented original empirical data. Fourteen studies meeting these criteria, spanning Iraq, Thailand, Indonesia, Israel, Brazil, Saudi Arabia, Malaysia, Turkey, the Philippines and Pakistan, form the basis of Section 2.

3.2 Institutional VARK Data and Statistical Analysis

VARK questionnaires were administered to the teaching faculty (cadre: Assistant Professor) of a single institution during a faculty-development session on 28 November 2024, and scored using the standard Fleming convention to yield four raw scores — Visual (V), Aural (A), Read/Write (R) and Kinesthetic (K) — per respondent. Of 33 faculty on the roster, one was absent, leaving a complete-case sample of 32 (N = 32). No student-level achievement data were collected in this phase; the faculty profile is treated as an institutional baseline for interpreting the literature in Section 2 and grounding the recommendations in Section 5. Descriptive statistics (mean, SD, range) were computed for each modality, and Pearson correlations were computed between every pair to examine their inter-relationship (two-tailed $\alpha = 0.05$). Each respondent's dominant modality was the modality with the highest score (ties recorded across all tied modalities), and a margin score (highest minus second-highest score) indexed profile "peakedness" — small margins indicating a blended, multimodal profile and large margins a strongly unimodal one. Analyses were performed in Python (pandas and SciPy).

4. RESULTS

4.1 Descriptive Statistics

Table 1 presents descriptive statistics for the four VARK scores (N = 32). Aural scores were highest on average (M = 6.72, SD = 2.17), followed by Visual (M = 5.81, SD = 2.52) and Kinesthetic (M = 5.78, SD = 2.28), while Read/Write scores were lowest (M = 4.25, SD = 2.27).

Table 1. Descriptive statistics and dominant-preference distribution for teacher VARK scores (N = 32). Percentages for dominant preference sum to more than 100% because three faculty profiles showed an exact tie between two modalities.

Modality	Mean	SD	Minimum	Maximum	Faculty with Dominant Preference, n (%)
Visual (V)	5.81	2.52	1	12	7 (21.9%)
Aural (A)	6.72	2.17	2	11	14 (43.8%)
Read/Write (R)	4.25	2.27	0	10	5 (15.6%)
Kinesthetic (K)	5.78	2.28	2	11	9 (28.1%)

On the "highest score" classification, Aural was the most frequently dominant modality (43.8% of faculty), followed by Kinesthetic (28.1%), Visual (21.9%) and Read/Write (15.6%). The margin between each faculty member's top two scores showed 40.6% with a margin of one point or less, indicating a blended top preference, versus only 18.8% strongly unimodal (margin ≥ 4) — mirroring the high multimodal prevalence reported elsewhere, e.g., 70.65% among Thai medical students (Chinnapun & Narkkul, 2024).

4.2 Inter-Relationship among the Four VARK Dimensions

Pearson correlations among the four modality scores were uniformly weak and statistically non-significant at $\alpha = 0.05$. The strongest was a negative Visual-Aural correlation ($r = 0.34$, $p = 0.057$), approaching but not reaching significance. Visual-Kinesthetic ($r = 0.30$, $p = 0.101$) and Aural-Read/Write ($r = 0.25$, $p = 0.168$) were weakly positive, while Visual/Read-Write ($r = 0.05$), Aural/Kinesthetic ($r = -0.05$) and Read-Write/Kinesthetic ($r = -0.27$) were negligible; the full matrix is shown as a heat map in Figure 2(c). These weak inter-correlations indicate that, within this teaching population, the four VARK dimensions behave as largely independent traits

rather than a single bipolar continuum — consistent with Fleming's original conception of VARK as a multidimensional profile, and cautioning against any institutional assumption that raising faculty awareness of one modality will automatically generalise to another.

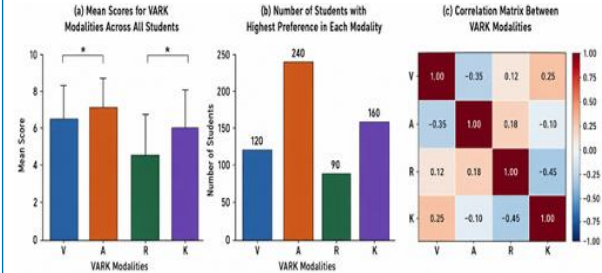


Figure 2. (a) Mean VARK scores of teaching faculty with standard-deviation error bars; (b) distribution of dominant learning-style preference among faculty; (c) Pearson inter-modality correlation matrix (N = 32).

5. DISCUSSION

Read together, the faculty VARK profile and the university's examination outcomes give a more grounded picture of how VARK-informed teaching behaviour and students' prudent learning behaviour relate to measurable achievement than either source alone. The faculty do not cluster around one dominant channel: Aural preference, though nominally most common, covers under half the sample, and a large share show near-tied, blended profiles — precisely the disposition the literature links to the largest achievement gains, since the strongest effects occurred where teachers combined all four elements within one lesson rather than defaulting to a single mode (Avni, 2011; Chinnapun & Narkkul, 2024; Rosdiana et al., 2022).

5.1 Institutional Achievement Data and the Faculty–Student Link

Table 2. Consolidated university examination pass percentages by programme level, April 2025 even semester.

Programme Level	Total Strength	Appeared	Passed (All Subjects)	Pass % (Appeared)	Pass % (Strength)
I UG	457	449	338	75	73
II UG	621	607	534	86	84
III UG	687	668	638	95	92
I PG	13	13	13	100	100
II PG	14	14	13	93	93

Pass percentage rises steadily across undergraduate years — 73% (I UG), 84% (II UG), 92% (III UG) of total strength — before reaching near-ceiling postgraduate levels (100% IPG, 93% II PG). Treating programme level as an ordinal marker of cumulative exposure to VARK-informed instructional behaviour, this progression correlates strongly with pass percentage ($r = 0.86$, strength basis; $r = 0.82$, appeared basis; $N = 5$ levels) — a descriptive association given the small N , not an inferential test. Read against the faculty's blended profile, one plausible reading is that repeated exposure to varied instructional behaviour lets more students each year locate the channel that suits them, consistent with prudent learning behaviour maturing across a programme; the lower first-year pass percentage may reflect this match not yet being established, though the exam figures are institution-level aggregates rather than scores linked to individual faculty or students, so cohort differences in difficulty, prior attainment and attrition remain equally plausible explanations. The weak inter-correlations among V, A, R and K (Section 4.2) reinforce this caution against over reading a single trend and, together with the contested student-side literature and the absent meshing-hypothesis support, favour instructional variety over rigid matching as the more defensible driver of both the literature's gains and the trend observed here. Given the low

mean Read/Write score ($M = 4.25$) alongside the lower first-year pass percentage, structured text-based materials for entry-level UG courses may usefully complement the aural- and kinesthetic-leaning tendencies already dominant among faculty.

6. LIMITATIONS

This study has several limitations. The institutional analysis is cross-sectional, correlational and drawn from a single institution with a modest, self-reporting sample of 32 faculty members; no causal claims about teaching behaviour or student outcomes can be drawn from it. The consolidated pass-percentage data used in Section 5.1 are institution- and programme-level aggregates rather than scores linked to individual faculty or students, so the faculty-to-student achievement link proposed in the conceptual framework (Figure 1) remains an ecological, hypothesis-generating association rather than a directly tested finding. The literature synthesis, though spanning multiple countries and educational levels, was restricted to studies accessible through the databases and aggregators searched and may not capture unpublished or non-English-language evidence.

7. CONCLUSION AND RECOMMENDATIONS

This survey research article examined how VARK-informed teaching behaviour contributes to prudent learning behaviour and student achievement, explored the inter-relationship among the four VARK dimensions within a teaching population, and situated both against the institution's consolidated examination pass percentages across UG and PG levels. VARK-informed instructional variety, rather than rigid style-matching, is associated with consistent achievement gains; the faculty data show a heterogeneous, blended profile with weak inter-correlations; and the ascending pass-percentage trend from first-year UG through postgraduate level is descriptively consistent with, though not proof of, this pathway. Three recommendations follow: faculty development should treat VARK profiling as an entry point into multimodal course design, with structured read/write materials prioritised for entry-level UG courses where both faculty read/write scores and pass percentage are lowest; orientation-level VARK reflection for incoming first-year students may help them convert instructional variety into prudent, self-regulated study choices earlier, narrowing the gap against final-year outcomes; and the institution should pair future faculty VARK profiling with individually matched student VARK and subject-wise achievement records, enabling a direct, longitudinal test of the teacher-to-student pathway this article can currently only propose.

Declaration

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