



Qur'anic Calligraphy: A Systematic Review Across Manuscripts, Sacred Architecture, Education, and Digital Preservation

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Abstract

Background: Qur'anic calligraphy connects sacred text with handwritten manuscripts, architectural inscriptions, educational practices and digital images, yet published studies use heterogeneous objects and evaluative criteria. Objective: This review project examines how empirical research documents the material, visual, social, pedagogical and technological dimensions of Qur'anic writing. Data sources: A reproducible strategy is proposed for Scopus, Web of Science, publisher platforms and relevant specialist journals for 2019–October 2026. Eligibility: Original journal research directly examining identifiable Qur'anic calligraphic text or Qur'an-writing practice is eligible; reviews, non-Qur'anic Arabic calligraphy and unsourced commentary are excluded from the planned primary corpus. Methods: The proposed protocol specifies DOI-first deduplication, dual screening, design-sensitive appraisal and narrative synthesis. Targeted publisher/journal discovery located 22 plausible primary article records; this is an illustrative set, not a completed PRISMA sample. Preliminary findings: Codicological research describes differences in manuscript scripts, decoration and writing materials; mosque studies distinguish spatial placement and devotional reception, including legibility concerns. Educational studies report instructional activities and engagement but rarely provide controlled evidence of causal effects. Material science and document-processing studies enable pigment characterization and image comparison, although output validity depends on specific objects, data and reference standards. Limitations: Complete database exports, independent screening, comprehensive full-text review and finalized risk-of-bias judgments were unavailable. No search-yield, exclusion, prevalence or pooled-effect claims are made. Conclusion: Future synthesis should keep textual accuracy, visual complexity, reception, learning performance and computational recognition distinct, combining reproducible documentation with expert interpretation. Registration: Not registered.

Keywords: manuscript codicology; Islamic epigraphy; visual reception; religious pedagogy; document image analysis

1. Introduction

Qur'anic calligraphy occupies an unusually dense cultural position because the written sign is simultaneously a legible segment of revelation, a product of skilled visual composition, and a material object handled, displayed, learned, and preserved in distinct communities. In a handwritten muṣḥaf, script, diacritics, page geometry, illumination, inks, and binding act together to mediate access to the text. On a mosque wall, selected verses become part of an architectural environment in which scale, placement, and visual hierarchy can be as significant as decorative form. In a classroom, carefully formed letters may function as an instrument for writing practice or religious engagement. Digital imaging, meanwhile, creates new possibilities for examining and checking this visual material but also introduces uncertainty about what software can reliably interpret. Such diversity of sites and purposes makes “Qur'an and calligraphy” an attractive research topic yet an insufficiently specified review question.

A first distinction concerns the Qur'anic textual object and the larger domain of Arabic calligraphic art. Not every piece of Arabic calligraphy reproduces a verse from the Qur'an: it may contain a devotional formula, a hadith, a poetic line, a personal name, or a purely artistic arrangement. A review that combines every Arabic inscription without identifying its textual source risks attributing visual or spiritual claims to Qur'anic material where the connection is only generic. The present review therefore gives priority to research directly analysing Qur'anic text in calligraphic form, Qur'anic codices or muṣḥaf writing, or teaching in which writing Qur'anic verses is an explicit activity. Studies of general Arabic calligraphy may clarify technique but should not enter the primary corpus simply because the script is Arabic. This boundary is particularly important for architectural surveys and computer-vision research, whose titles may use broader terminology than their actual datasets.

Manuscript research illustrates both the strengths and limitations of this field. Indonesian studies describe regionally distinctive illuminations, paper, ink colours, and Naskhi writing, often drawing historical inferences from a small number of surviving objects. The manuscript devoted to Hj. Fatimah Siti Hartinah Soeharto demonstrates how decorative programs can also articulate commemoration and patronage; the Madurese manuscript case describes script and ornament as part of local codicological practice. Parallel investigations of the Raden Sholeh Drajat and Mbah Ismail manuscripts similarly treat page arrangement, materials, and writing practices as evidence of the social lives of Qur'anic texts. These findings invite comparison, but a case description does not by itself establish a frequency of a script style or a regional lineage. (Izzah et al., 2022) (Alim, 2023) (Awwaliyah et al., 2023) (Magfiroh and Muttaqin, 2024)

The movement from manuscript page to architectural wall changes the analytic unit. Inscriptions in mosques are not read in the same manner as pages: their location, repetition, height, legibility, and the visitor's position can shape encounter with the text. Research in Peninsular Malaysia maps calligraphic scripts across architectural components; case studies in Probolinggo, Palangka Raya, Sukoharjo, and multiple Indonesian mosques describe the interplay of ornament, Qur'anic verse selection, religious identity, and reported reception. A particularly useful tension emerges where aesthetically elaborate writing becomes difficult for worshippers to read. This is not a contradiction to be resolved by declaring ornament good or bad; it is an invitation to distinguish visual experience, recognizability, actual decoding, and recalled devotional content. (Kamarudin et al., 2020) (Fawaid and Sultoni, 2022) (Hamidinnor et al., 2024) (Siyamto et al., 2025) (Dariyadi et al., 2025)

Education presents an additional ambiguity. Calligraphy may improve students' handwriting through intensive practice, but reports of enthusiasm, enjoyment, or moral character do not automatically demonstrate gains in Qur'anic textual accuracy. Classroom studies of Quran reading and writing, Naskh demonstrations, collage-based tasks, and extracurricular calligraphy document varied pedagogical arrangements. Their endpoints include motivation, disciplined participation, letter proportions, placement of vocalization marks, and the perceived meaningfulness of learning. Comparative synthesis should not force these outcomes into a single effectiveness score. A transparent extraction scheme must identify the participant population, writing task, length of exposure,

observation or test method, and whether the evidence comes from learners, teachers, or actual scripts evaluated against an explicit rubric. (Muyassaroh et al., 2022) (Farih, 2023) (Maghfiroh, 2025) (Kahfi et al., 2026) (Lestari and Sapri, 2026)

Digital and material-science studies are emerging as possible bridges between visual scholarship and quantitative analysis, but the bridging claims need scrutiny. Non-invasive analytical work on a deteriorated early Qur'anic fragment shows how spectroscopy can clarify pigments previously ambiguous to palaeographers. Conversely, optical character recognition and pixel-based image comparison offer machine-readable traces of selected forms of Qur'anic writing. They do not automatically validate the religious correctness of a verse, date a codex, or measure a person's understanding. Methodologically, printed Uthmanic script, manuscript handwriting, monumental inscriptions, and highly stylized contemporary calligraphy are separate image domains. A model that performs well on one may fail on another unless the test design explicitly measures transfer and records likely error modes. (Marotta et al., 2025) (Mohd et al., 2021) (Widyaningsih et al., 2025)

The primary question guiding the proposed review is: how do empirical studies published between 2019 and October 2026 document the production, visual mediation, pedagogy, and conservation of Qur'anic calligraphy, and what kinds of evidence warrant their claims? Four secondary questions correspond to the proposed synthesis: (RQ1) what material and script features of Qur'anic manuscripts are investigated; (RQ2) how do mosque inscriptions function visually and socially; (RQ3) how is Qur'anic calligraphy taught and assessed; and (RQ4) what can digital recognition and conservation techniques establish about written authenticity, legibility, and preservation? The contribution sought is a cross-setting evidence framework that separates the material artefact, the visible script, the semantic content, and the user's response. A final systematic review will need a frozen database search, complete screening records, full-text extraction, and design-specific appraisal. The current chapter-level mapping is intended to make that later synthesis more precise rather than to substitute for it.

2. Methods

2.1. Review design and information sources

This article is the first-draft stage of a planned systematic review with narrative synthesis. The intended reporting framework is PRISMA 2020, supplemented by PRISMA-S for reproducible bibliographic searching and SWiM principles if numerical pooling is inappropriate. The design explicitly distinguishes descriptive codicology, field-based reception research, instructional evaluation, and computational validation because their study units and evidential standards are not commensurable. No preregistration number is reported. Any final review must timestamp its protocol and identify changes to date limits, eligible languages, document types, or the interpretation of "Qur'anic" before the principal screening phase. (Page et al., 2021) (Rethlefsen et al., 2021) (Campbell et al., 2020)

The proposed search window is 1 January 2019 to 11 October 2026, selected to retain recent studies while allowing foundational computational and architectural research published shortly before 2022. Searches should be conducted in Scopus

and Web of Science Core Collection where institutional access is available, alongside targeted searches of relevant publishers and journal platforms for Islamic art, Qur'anic studies, codicology, heritage conservation, architecture, education, and document analysis. A high-sensitivity query combines alternative spellings (Qur'an, Quran, Qur'anic, mushaf), the object or practice (calligraph*, khat, manuscript*, illumination, inscription*, paleograph*, typograph*), and study contexts or methods (mosque, codicolog*, art, education, preservation, digit*, recognition, reception). Strings and syntax-specific adaptations appear in Appendix C. These search strategies are proposed and have not been executed as comprehensive, date-stamped Scopus or Web of Science exports.

2.2. Eligibility, selection and data extraction

The principal eligibility category consists of original peer-reviewed research articles analysing identifiable Qur'anic calligraphic objects, Qur'anic verse inscriptions, Qur'an-writing pedagogy, or digitized Qur'anic writing. Eligible empirical approaches include qualitative case studies and interviews, comparative artifact documentation, laboratory materials analysis, quasi-experimental instruction, and applied image-processing studies with a defined dataset or artifact. Publication language is not restricted at search stage; English, Arabic, and Indonesian reports may be considered if the article's evidence can be interpreted and documented accurately. Books, dissertations, editorials, conference abstracts, narrative and systematic reviews, and purely conceptual essays will not be counted as included original journal research. Articles about general Arabic decorative script without a demonstrated Qur'anic context will be screened out of the principal synthesis.

The final study-selection procedure requires importing complete database exports with persistent source identifiers. DOI normalization should be followed by exact-title deduplication and cautious manual resolution of near duplicates. Two reviewers should independently screen titles/abstracts and then full texts; disagreements should be reconciled with a logged decision and a third reviewer if required. At full text, exclusions should use mutually exclusive priority reasons, including absence of a Qur'anic inscription or writing task, non-primary design, inadequate description of the studied object, and no extractable study-level evidence. The present targeted discovery exercise identified 22 promising primary article records on publisher or journal pages. They constitute a provisional illustrative corpus, not the yield of an executed database strategy. Therefore a standard numerical PRISMA flow with search hits, duplicates, and excluded reports cannot honestly be supplied. Figure 1 depicts the intended workflow and labels each unperformed step explicitly.

A structured extraction form will record title, DOI or publisher URL, publication year, location, article language, setting, primary unit (manuscript, verse, inscription, participant, or page image), study design, sample frame, exact Qur'anic text or corpus, named script style, physical medium, key findings, and limits. For codicology, add material, provenance, dated evidence, ornament placement, rasm, and diacritics; for architecture, add site, verse identification, spatial location and reader accessibility; for education, document curricular content, intervention duration, baseline skill and measured outcomes; and for computational studies, record model, training/test partitions, expert verification,

error metrics and dataset availability. These fields prevent a numerical result from one modality being misconstrued as a claim about another. A candidate-by-candidate extraction matrix is supplied in Appendix D.

2.3. Appraisal, evidence synthesis and protocol limitations

Appraisal will be design-sensitive rather than based on a single global checklist. Artifact studies will be assessed for provenance, image sufficiency, transcription fidelity, replicable feature coding and distinction between direct observation and interpretation. Interview and case-study evidence will be assessed for recruitment, positionality, data triangulation and negative cases. Education designs will be assessed for baseline comparability, assessor blinding where feasible, outcome definition, attrition and follow-up. Computational work will be assessed for image-domain shifts, train/test leakage, expert-labelled ground truth, confidence intervals and external validity. Certainty statements should remain descriptive unless a clearly comparable body of outcomes justifies more formal grading. No finalized dual-reviewer quality scores or pooled effects are available at this draft stage.

Results will be synthesized by four a priori themes. The source-specific statements in Tables 1–4 reflect accessible publisher abstracts, bibliographic records and, where directly viewed, public article material. They will not be treated as extracted full-text outcome datasets until checked against complete papers. When a paper reports a computational metric, the outcome will be paired with its original validation context; when a paper reports an improvement in learner engagement, the review will distinguish participant impressions from independent performance measurement. An eventual sensitivity analysis should exclude records with missing full texts, insufficient Quran-specific evidence or unclear date metadata, and compare its thematic conclusions with those of the wider provisional pool. No meta-analysis is planned because the currently identified outcomes do not share a defensible effect-size definition.

Figure 1 summarizes the planned identification, screening, and eligibility pathway; it is deliberately non-numerical because comprehensive search records were not generated. Figure 1 must be replaced after a real database export and reviewer decision log exist.

3. Theoretical Background

3.1. Text, visual form, and material practice

Theoretically, Qur'anic calligraphy can be analyzed as three connected but nonidentical objects: a textual inscription carrying Arabic words, a visual configuration of strokes and ornamental relations, and a material or social practice through which people handle or encounter the inscription. In a codex, the line arrangement and colour of signs can affect how a text is read and transmitted. In a mosque, physical placement affects the ways inscriptions enter attention, memory, and worship. In a lesson, controlled repetition can turn a textual sequence into a motor and perceptual skill. These differences are not merely contextual modifiers: they determine what a defensible outcome measure can be. Figure 2 maps the four evidence settings against these analytic dimensions.

The manuscript strand makes particularly clear why ornament and script are not interchangeable. Illumination may frame textual divisions and indicate patronage or region, while a script hand informs stroke geometry, legibility and scribal training. A study can identify Naskhi without establishing what a historical user understood from the decorated page; conversely, a pigment analysis can reveal that different colour classes were functional in diacritic notation even when their present-day visual appearance has deteriorated. Such findings require attention to provenance and successive interventions in the manuscript's history, including restoration, redotting or transfer of pigment between folia. (Alim, 2023) (Awwaliyah et al., 2023) (Marotta et al., 2025)

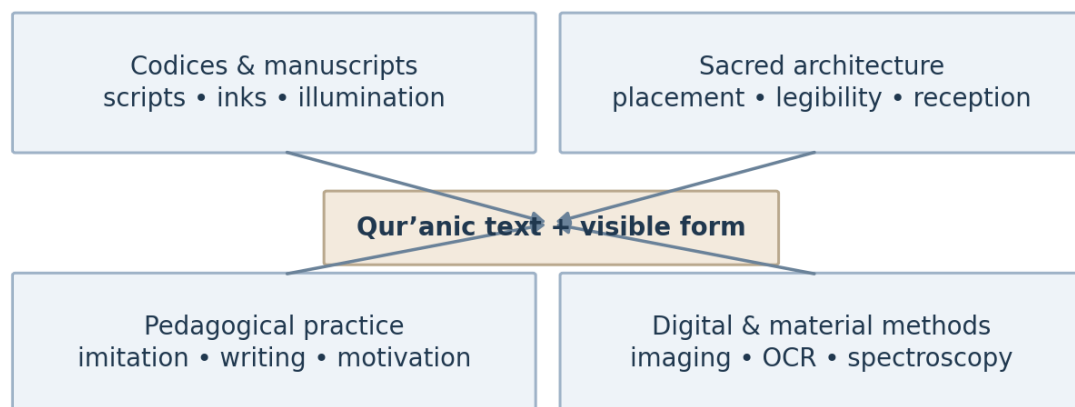


Figure 2. Cross-setting conceptual framework for Qur'anic calligraphy. Links indicate analytical dimensions rather than established causal pathways.

3.2. Reception, learning, and interpretive validity

The spatial strand benefits from distinguishing legibility, recognition, and reception. Seeing a familiar Qur'anic passage displayed above a mihrab need not imply that every viewer can decipher the stylized letterforms at that location. Likewise, interview descriptions of comfort or devotion may reflect the broader environment rather than demonstrable effects of one inscription. The reported difficulty of reading some wall calligraphy in Palangka Raya is especially useful as a counterexample to a simplistic assumption that aesthetic complexity always improves textual access. A strong future synthesis should code whether the study measured script identification, verse recall, comprehension, reported sentiment, or design intention. (Hamidinnor et al., 2024) (Siyamto et al., 2025)

For pedagogy and digital scholarship, validity also hinges on observable criteria. A calligraphy lesson may legitimately aim at graphic accuracy, discipline, visual appreciation or Qur'anic literacy; those goals should be judged separately. A recognition algorithm can be assessed using character or word error, while an editorial verification tool needs an independently established standard text and a transparent record of false positives and false negatives. No algorithm should be

presented as an autonomous arbiter of textual or theological authority. Figure 3 outlines a layered validation pathway in which computational similarity checks lead to expert inspection rather than replace it. (Muyassaroh et al., 2022) (Mohd et al., 2021) (Widyaningsih et al., 2025)

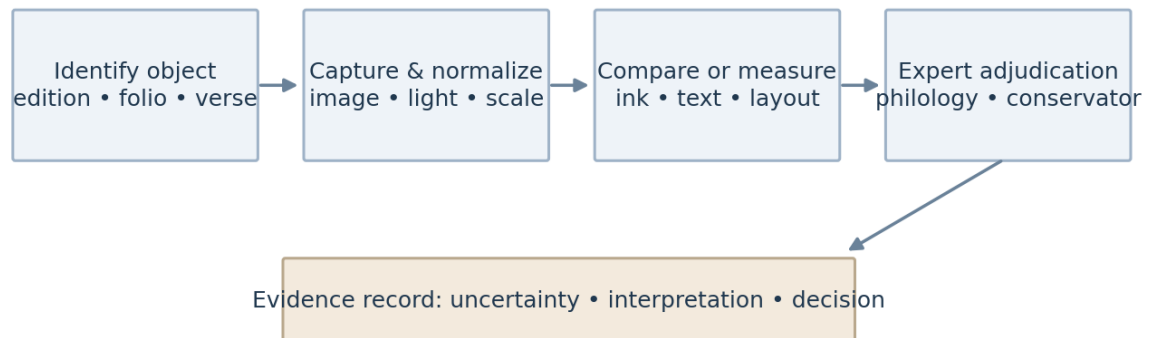


Figure 3. Proposed layered verification of Qur'anic script imagery and artefacts: from documented capture to expert adjudication. The figure is a research workflow, not a tested algorithm.

4. Results: Provisional Thematic Evidence Mapping

The 22 records in Tables 1–4 were located by targeted scholarly discovery, checked against relevant journal or publisher records, and grouped by dominant research focus. They have not been subjected to a complete PRISMA search and independent full-text eligibility process. Reported findings below should be read within those limits; no final risk-of-bias rates, pooled effect sizes, or thematic prevalence estimates are computed.

4.1. Manuscripts, scribal forms, and illumination

Table 1 provides an article-level extraction of the provisional records supporting this theme; the sample is not a finalized systematic-review corpus.

Seven candidate studies in Table 1 address manuscript artifacts as joined textual and visual objects. (Izzah et al., 2022) describes a commemorative Qur'anic muṣḥaf with a distinctive calligraphic and illuminated program; (Anggraini and Makmun, 2022) investigates a Lamongan manuscript through codicological and textological observation. Studies by (Alim, 2023) and (Awwaliyah et al., 2023) likewise treat the physical book—its script, paper and ornament—as a source of information about copying traditions. They share an emphasis on the manuscript rather than a randomized population of readers. The most important commonality is methodological: the article's artifact is the sample, and no general denominator for all manuscripts can be inferred from the sum of these cases.

The remaining cases document distinctive contexts rather than one linear visual evolution. (Magfiroh and Muttaqin, 2024) reports Naskhi lettering and a limited floral illumination program on a museum object; (Najihah and Humam, 2025) examines old paper, rasm and material characteristics of a Kudus collection. A

cross-regional comparison by (Setiawan et al., 2026) contrasts the geometric and chromatic visual programs of manuscripts A47 (Terengganu) and A694 (Aceh). These differences illustrate why the review should extract provenance, dimensions, ornament placement and transcription conventions separately, rather than treat “beautiful calligraphy” as an unexamined category.

Table 1 should be read as evidence of local variation and analytical practice, not a statistical map of the history of Qur'anic writing. Its entries are mostly single-object or small-set qualitative case studies. A full-text quality audit must examine whether decorative claims are supported with properly identified folia or images, whether dating is anchored in independent documentary or materials evidence, and whether the terms Naskhi, Kufic and illumination are applied consistently. Figure 2 makes these units of inference explicit by separating the material object from later viewer reception.

Table 1. Provisional, source-record-supported research extraction: manuscripts, scribal forms, and illumination.

Study	Extractable source-supported information	Limitation / verification requirement
(Izzah et al., 2022)	Philological description examines illumination and calligraphic ornament in a commemorative Indonesian mushaf.	Single manuscript; symbolism needs full-text appraisal.
(Anggraini and Makmun, 2022)	Codicological and textual study of a locally held Qur'anic manuscript documents manuscript characteristics.	Evidence currently traced through journal reference trail; full-text audit pending.
(Alim, 2023)	Study describes predominantly Naskhi script and modest floral illumination in a Madurese manuscript.	Single object; dating and script classification require independent corroboration.
(Awwaliyah et al., 2023)	Codicological field/literature study associates European paper and floral illuminations with the manuscript's history.	Historical dating inferred from artifact attributes; not independently proven causation.
(Magfiroh and Muttaqin, 2024)	Case study documents Naskhi script, black/red inks and small floral illuminations in a museum-held mushaf.	A single manuscript, descriptive codicology.
(Najihah and Humam, 2025)	Primary codicological/orthographic analysis of a historic paper mushaf kept in Kudus.	No DOI displayed on publisher record; visual details require full-text confirmation.
(Setiawan et al., 2026)	Comparative codicology distinguishes gold/geometric illumination in Terengganu A47 from red/black floral forms in Aceh A694.	Two-object study; dating and qirā'āt claims need specialist audit.

As summarized in Table 1, the themes are descriptive groupings of distinct designs, not common effect-measure families. Their differences inform the integrated argument in Section 5.

4.2. Mosque space and Qur'anic reception

Table 2 provides an article-level extraction of the provisional records supporting this theme; the sample is not a finalized systematic-review corpus.

The five studies in Table 2 show that Qur'anic script changes role when inscribed in built space. (Kamarudin et al., 2020) investigates script profiles and placement in Peninsular Malaysian mosques, while (Fawaid and Sultoni, 2022) examines mosque calligraphy through a Living Qur'an reception lens in Probolinggo. These studies ask related but different questions: architectural composition concerns where and how writing appears, whereas reception concerns the practices and interpretations of people who encounter it. Without common measurement, neither should be collapsed into a percentage of worshippers influenced by calligraphy.

At the Nurul Islam Grand Mosque, (Hamidinnor et al., 2024) reports deliberately selected familiar Qur'anic passages together with a criticism that some calligraphy is hard to read. In Sukoharjo, (Siyamto et al., 2025) documents worshippers' and visitors' responses to named Qur'anic passages rendered in Thuluth. A multi-site Indonesian architectural study by (Dariyadi et al., 2025) documents how Thuluth, Kufic and Naskh script forms interact with mosques' architectural components. The juxtaposition shows that successful decoration, recognized devotional meaning and accessible reading are potentially distinct outcomes.

Table 2 therefore supports a proposal to code verse identity, script, mounting position, physical access and reception data as separate variables. It does not license a universal interpretation of mosque calligraphy or an unverified nationwide prevalence estimate. Comparing the cases will require better information on how buildings were selected, which viewers were interviewed and whether the forms were actually read. The interplay of aesthetics and legibility also appears in the integrated framework in Figure 2.

Table 2. Provisional, source-record-supported research extraction: mosque space and qur'anic reception.

Study	Extractable source-supported information	Limitation / verification requirement
(Kamarudin et al., 2020)	Analyzes visual features and placements of calligraphy scripts in mosque architectural components.	Not every architectural inscription is necessarily Qur'anic; extract only verified verses.
(Fawaid and Sultoni, 2022)	Living-Qur'an study examines aesthetic/receptive dimensions of mosque inscriptions in Probolinggo.	Site-dependent interpretation; audience details pending.

Study	Extractable source-supported information	Limitation / verification requirement
(Hamidinnor et al., 2024)	Field research links Qur’anic verse selection, devotional function and legibility criticism inside a mosque.	Qualitative site-specific findings, not a prevalence estimate.
(Siyamto et al., 2025)	Qualitative research analyzes responses to Thuluth inscriptions including Qur’anic passages displayed in a mosque.	Publication year set by volume of record (2025); online metadata has 2024 discrepancy.
(Dariyadi et al., 2025)	Qualitative case studies examine Thuluth, Kufic and Naskh placement on Indonesian mosque architectural features.	The article’s national 60% estimate is not independently verified; do not generalize.

As summarized in Table 2, the themes are descriptive groupings of distinct designs, not common effect-measure families. Their differences inform the integrated argument in Section 5.

4.3. Qur’anic calligraphy in educational practice

Table 3 provides an article-level extraction of the provisional records supporting this theme; the sample is not a finalized systematic-review corpus.

Education studies in Table 3 investigate Qur’anic calligraphy both as writing practice and as an aid to engagement. In one elementary-school setting, (Muyassaroh et al., 2022) uses descriptive observations to consider calligraphy in Qur’an reading and writing. (Farih, 2023) studies demonstration-based Naskh instruction for Qur’anic handwriting. The settings differ markedly in age and instructional arrangement; the available records do not establish a common effect size. Their contribution is to identify how calligraphy can be embedded in structured educational activity and which process variables merit measurement.

Two qualitative instructional reports shift attention toward participation. (Maghfiroh, 2025) describes calligraphic collage used in non-formal Qur’anic lessons and teachers’ efforts to motivate students. (Kahfi et al., 2026) examines a Qur’anic learning program in Jayapura in which creative calligraphy accompanies reported enthusiasm and religious character. (Lestari and Sapri, 2026) identifies repeated copying, demonstrations and teacher support as key elements of a pesantren extracurricular program; the same study identifies constraints such as time, facilities and differences in prior ability. These observations identify plausible mechanisms but should not be rephrased as demonstrated causal impact.

A more useful synthesis would distinguish visual-motor outcomes, orthographic correctness, comprehension, and social or motivational response. Learning to draw a balanced Naskh letter does not necessarily imply understanding an ayah; conversely, learners may engage meaningfully with selected verses without passing a highly formal calligraphy assessment. Table 3 indicates where the intervention, comparison, measurement and population fields need to be checked

in full text. The measurement chain anticipated in Figure 3 could eventually assist in scoring letter formation, but expert educational assessment remains necessary.

Table 3. Provisional, source-record-supported research extraction: qur'anic calligraphy in educational practice.

Study	Extractable source-supported information	Limitation / verification requirement
(Muyassaroh et al., 2022)	Qualitative observational study links calligraphic teaching with students' Qur'an reading/writing practice.	Non-randomized design, no causal effect size established; DOI spelling requires confirmation.
(Farih, 2023)	Describes Naskh demonstration-based teaching for writing Qur'anic text in an Islamic education program.	Language is Arabic; verify instructional outcomes and sampling in full text.
(Maghfiroh, 2025)	Qualitative case study reports observed engagement with collage calligraphy during Qur'anic lessons.	Teacher/student perceptions are not controlled learning-gain estimates.
(Kahfi et al., 2026)	Qualitative interviews and observations explore motivation, learning interest and religious character in Qur'an-calligraphy teaching.	Author-reported positive perceptions cannot establish causality.
(Lestari and Sapri, 2026)	Field study documents drill, imitation and supervision in writing Qur'anic verses, plus access and time constraints.	Observational design; outcomes and training context need full-text assessment.

As summarized in Table 3, the themes are descriptive groupings of distinct designs, not common effect-measure families. Their differences inform the integrated argument in Section 5.

4.4. Material analytics and digital text verification

Table 4 provides an article-level extraction of the provisional records supporting this theme; the sample is not a finalized systematic-review corpus.

The five studies in Table 4 are analytically heterogeneous. (Marotta et al., 2025) combines philological reading and non-invasive material science to identify multiple pigments in an early Qur'anic fragment, clarifying what coloured dots might have represented before degradation. By contrast, (Mohd et al., 2021) builds deep-learning optical recognition models for printed Qur'anic images. These are complementary contributions to legibility and preservation, but they do not address the same object or claim: one reconstructs a historical material sign system and the other measures recognition of a defined image dataset.

The distinction extends to document-processing and verification work. (Shiekh et al., 2021) proposes an image-based approach to separating diacritics, a problem

that matters for Qur'anic pages but for which the source record does not establish full end-to-end accuracy. (Widyaningsih et al., 2025) instead applies pixel matching and structural similarity to detect potential differences from the Indonesian Standard Mushaf. (Alzaky et al., 2019) examines recognition of khat patterns through fuzzy associative memory; the exact test corpus needs full-text verification before any Qur'anic-specific accuracy can be asserted. Across the five studies, model inputs and reference standards vary sufficiently that pooling accuracy claims would be methodologically indefensible.

Figure 3 shows the validation pathway suggested by this strand. The first layer concerns image capture and documented object identity; the second involves segmentation and comparison; the third involves expert verification of source text, writing conventions and meaningful discrepancies. A flagged pixel difference may be caused by alignment or imaging conditions, while a genuine scribal variant may require philological interpretation. The evidence in Table 4 points toward carefully benchmarked decision support, not an automatic replacement for calligraphers, conservators or Qur'anic verification specialists.

Table 4. Provisional, source-record-supported research extraction: material analytics and digital text verification.

Study	Extractable source-supported information	Limitation / verification requirement
(Marotta et al., 2025)	Non-invasive spectroscopy and philology identify coloured diacritic pigments in a degraded Qur'anic fragment.	Single fragmented codex, results on writing-material characterization.
(Mohd et al., 2021)	Builds an OCR resource/model for printed Qur'anic images, including Uthmanic script and diacritics.	Printed mushaf OCR is not equivalent to historical calligraphy or decorative inscriptions.
(Shiekh et al., 2021)	Proposes region-based diacritic segmentation; discusses relevance of diacritic extraction to mushaf images.	Framework-level study, no validated end-to-end Qur'an manuscript accuracy.
(Widyaningsih et al., 2025)	Block-image pixel matching and SSIM used to flag writing discrepancies against standard mushaf template.	Image difference detects discrepancies, not autonomous religious textual adjudication.
(Alzaky et al., 2019)	Image pattern recognition applies fuzzy associative memory to Islamic khat/calligraphic forms.	Title and computational design are broad; substantive verse test set needs full text.

As summarized in Table 4, the themes are descriptive groupings of distinct designs, not common effect-measure families. Their differences inform the integrated argument in Section 5.

5. Discussion

Taken together, the preliminary literature suggests that the most productive cross-disciplinary account of Qur'anic calligraphy treats writing simultaneously as text, artifact, situated display, and learned or digitized practice. The contribution of this approach is not a novel universal theory of calligraphy but a falsifiable classification of what each empirical paper claims to establish. Descriptive codicology supports statements about the features of particular objects; architectural reception studies support statements about selected sites and the people surveyed; pedagogical studies support claims about defined learning settings; and document-processing experiments support claims about accuracy against particular image and text references. Tables 1–4 reveal considerable richness in each domain but little direct interchangeability of their measurements.

This finding exposes a persistent inferential hazard: categories such as beauty, spiritual meaning, literacy, and authenticity are often treated as if they were naturally synchronized. The paper on Nurul Islam Mosque reports that elaborate and meaningful Qur'anic inscription can coexist with visitor difficulty in deciphering it, while manuscript analyses show that ornate pages convey evidence of visual tradition without automatically telling us how past readers used them. A credible comparative program would therefore measure visual appreciation and functional legibility separately. It would also distinguish a viewer's recognition that an inscription contains scripture from the ability to reproduce or understand the particular Qur'anic words. (Hamidinnor et al., 2024) (Siyamto et al., 2025) (Magfiroh and Muttaqin, 2024)

A second implication concerns the temporality of artifacts. A Qur'anic manuscript is not static: the current state of its pigments, marginal signs, paper and binding may differ from the state in which it was first copied or subsequently used. The chemical study of the Hamburg fragment demonstrates that pigment deterioration and transfer can obscure earlier sign conventions, and that laboratory measurement can materially alter philological interpretation. Cross-regional manuscript comparisons add a cultural dimension by tracing different palettes and ornamental repertoires. Neither approach alone settles every matter of provenance or textual history, but together they show the scientific advantage of combining material examination with careful manuscript transcription. (Marotta et al., 2025) (Setiawan et al., 2026) (Awwaliyah et al., 2023)

A third issue is selection. The high salience of richly decorated mosque interiors or well-preserved individual muṣḥafs can make these examples disproportionately visible in public research. A bibliographic synthesis based on readily available journals may reproduce the same visibility bias: it privileges objects that have been catalogued, photographed, accessible to researchers, and written about in languages indexed by searchable platforms. The planned search therefore requires broader Islamic-studies and heritage indexing, transparent language rules, and documentation of inaccessible full texts. It should report the location and condition of the object, and whether it was selected as exceptional, typical or merely accessible. Subgroup summaries should be carefully bounded by what the corpus actually contains.

Educational findings are promising as accounts of practice but still need stronger causal tests. When a study combines calligraphy with a motivated teacher,

collaborative work and additional time on task, there may be no simple way to attribute improved handwriting solely to the visual art form. Future controlled comparisons could use parallel groups exposed to identical Qur'anic passages but different writing practice, independent assessment of grapheme and diacritic accuracy, delayed retention tests, and measured comprehension. Qualitative interviews should remain an important complement because participants can explain how they experience the material; they should not be treated as a substitute for reliably measured skill gains. (Muyassaroh et al., 2022) (Farih, 2023) (Lestari and Sapri, 2026)

Computational studies raise a parallel challenge of benchmark validity. The printed muṣḥaf and highly stylized handwritten or architectural forms differ in page structure, ligatures, diacritic density and imaging artefacts. A model trained on one should not be assumed to generalize to another. Benchmark documentation should therefore identify the physical source, edition, segmentation unit, image resolution, transcription standard, annotator expertise and independence of the test set. Precision and recall for discrepancy flags should accompany any account of “verification,” including a manual record of false alarms and missed defects. When historical manuscripts are involved, conservation staff and palaeographers should jointly adjudicate uncertain signs; this interprofessional step is part of the analytical method, not an optional add-on. (Mohd et al., 2021) (Shiekh et al., 2021) (Widyaningsih et al., 2025) (Marotta et al., 2025)

The limitations of this draft are substantial and should guide rather than undermine future work. The 22 candidate primary studies were found through targeted public discovery and article-level publisher records; there has been no executed Scopus or Web of Science export, formal duplicate ledger, independent two-reviewer screening, comprehensive full-text extraction, or finalized design-specific appraisal. Consequently this document offers a preliminary cross-setting thematic map, not a numerical or certainty-graded outcome of an exhaustive systematic search. Figure 1, Appendix A and the editorial risk memo distinguish source-verified information from planned procedures. The 22 studies do not establish how prevalent an inscriptional theme is across published research, and they should not be counted as the final included studies before eligibility is confirmed.

There are nevertheless identifiable priorities for a mature systematic synthesis. First, a harmonized catalogue of Qur'anic calligraphic objects should distinguish the specific text, script, medium, provenance, condition, and visible ornament. Second, architectural and educational studies should operationalize legibility, reception and learning separately. Third, digital studies should publish relevant benchmark images, ground truths and error explanations while respecting image rights and the sacred status of the script. Together these steps would make disagreements across fields interpretable and permit future targeted reviews to examine a manageable outcome rather than “calligraphy” as an undifferentiated art category.

6. Conclusion

The preliminary research identified for this draft presents Qur'anic calligraphy as an interconnected field of textual practice, material heritage, architectural communication, education and digital support. Manuscript studies document variation in writing, illumination, inks and object history; mosque studies show how selected verses operate as visible parts of worship environments, while also raising legibility concerns. Educational case studies describe demonstrations, repetition and creative tasks that may encourage engagement and practice, but do not yet provide a common basis for causal estimates. Digital recognition and material analysis offer tools for documenting and checking visible signs, provided their limitations are made explicit.

The central methodological lesson is that strong claims require alignment among object, setting, construct and method. A history of pigments cannot by itself establish reader comprehension; a positive classroom account cannot independently prove writing accuracy; and a high image-matching score cannot replace expert judgment about a Qur'anic reading. To develop this first draft into a publication-ready systematic review, researchers must undertake and archive a full search, independent selection, full-text extraction and quality appraisal. Future studies should pair manuscript and architectural documentation with legibility testing, rigorous educational outcome measures and annotated digital benchmarks. These priorities offer a more defensible research agenda than declaring one script, medium or technology universally superior.

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