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The Qur'an's Encouragement of Science and Technology Education: Integrating *Qawliyyah* and *Kawniyyah* in QS al-ʿAlaq [96]: 1–5 and QS al-Ghāsyiyah [88]: 17–20

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Abstract:
Science and technology education requires more than technical competence; it also involves questions about how knowledge is acquired and how it should be used responsibly. In Islamic educational institutions, these concerns are often complicated by the separation of religious and scientific knowledge, while attempts at integration may remain limited to citing Qur'anic verses alongside scientific topics. This article examines how QS al-ʿAlaq [96]: 1–5 and QS al-Ghāsyiyah [88]: 17–20 can contribute to integrating *qawliyyah* and *kawniyyah* in science and technology education. Using a literature-based qualitative approach, the study proceeds through three stages: textual analysis, examination of selected classical and contemporary exegetical sources, and pedagogical analysis. The findings indicate that the two passages offer complementary educational contributions. QS al-ʿAlaq emphasizes reading, writing, and learning grounded in awareness of Allah, providing an orientation for the pursuit and transmission of knowledge. QS al-Ghāsyiyah, which in classical exegesis serves as an argument for Allah's power and resurrection, directs attention to concrete natural phenomena through the invitation to observe and reflect on their conditions and characteristics. Both passages are *āyāt qawliyyah*, while the natural phenomena to which QS al-Ghāsyiyah points represent the *kawniyyah* dimension. On this basis, the article proposes a conceptual framework comprising five interconnected dimensions: revelation as an orientation for learning, observation of nature, scientific inquiry, the application of knowledge and technological development, and value-based responsibility. The framework suggests three educational implications: strengthening literacy and information evaluation, developing observation- and inquiry-based learning, and fostering ethical responsibility in the use of technology. These implications constitute a conceptual proposal that requires further validation and empirical testing.

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Introduction (مقدمة)

The development of science and technology has placed education in a position that extends beyond the question of what students should know. Education is now also confronted with questions about how knowledge is acquired and for what purposes it is used. The latter question is particularly important because even the most sophisticated technologies involve decisions about who benefits from their use and who bears the associated risks. Studies on artificial intelligence ethics show that systems that appear neutral can reinforce existing biases and inequalities (Raquib et al., 2022), while engineering decision-making under uncertainty requires clear principles for determining acceptable levels of risk (Shaghaghi & Hosseinzadeh, 2026). Technical competence is therefore necessary, but it does not, by itself, provide guidance on when, why, and for whose benefit that competence should be exercised.

In Islamic education, this concern intersects with a longstanding problem: the separation of religious knowledge from scientific knowledge. This separation is partly rooted in the history of colonialism and the introduction of secular educational systems (Alamsyah et al., 2024). In Indonesia, it has also been among the factors that encouraged the transformation of IAIN into UIN institutions, with an emphasis on the integration of scientific knowledge (Khozin & Umiarso, 2019; see also Anwar & Elfiah, 2019). Nevertheless, the implementation of integration in educational practice does not always reflect its theoretical aspirations. A multi-site study of Islamic schools in Java found that integration commonly takes the form of Qur'anic verses retrieved from the internet and displayed on classroom walls, without being incorporated into lesson plans or assessment (Ghofur et al., 2021). Such practices demonstrate the presence of religious references in science education, but they do not necessarily indicate that Qur'anic perspectives have become part of the way students understand and engage with knowledge. This distinction raises a broader question about how integration can move beyond the symbolic inclusion of verses and influence educational thinking and practice.

The Qur'an offers a basis for addressing this problem through two complementary passages that emphasize different dimensions of the pursuit of knowledge. The first, QS al-ʿAlaq [96]: 1–5, opens with the command to read and refers to the pen as a means through which human beings are taught. The second, QS al-Ghāsyiyah [88]: 17–20, directs human attention to the natural world by inviting reflection on the creation of the camel, the sky, the mountains, and the earth. Although these passages address different aspects of human engagement with knowledge, they can be read together as complementary foundations: the former emphasizes reading, learning, and the acquisition of knowledge under divine guidance, while the latter directs intellectual attention toward the signs of creation. Their relationship thus provides an opportunity to examine how the pursuit of knowledge and the contemplation of nature can inform an integrated approach to science and technology education.

Both passages have been examined in previous studies from various educational perspectives. QS al-ʿAlaq has been studied through classical and contemporary exegesis (Anggraini & Pratama, 2024), including through a *maqāṣidī* framework (Hasyim & Nashrullah, 2025). Meanwhile, QS al-Ghāsyiyah has been examined in relation to educational values and concepts of learning (Amir, 2020; Bujangga, 2021), with subsequent research developing its interpretation into a Qur'an-based inquiry model (Hikmatiar et al., 2026). Nevertheless, three limitations emerge from the literature reviewed for this article. First, the implementation of

Qur'anic integration in education often remains at the level of verse citation rather than becoming part of the learning process (Ghofur et al., 2021). Research on school-level implementation suggests that integration becomes more meaningful when incorporated into learning objectives, content, procedures, and evaluation (Sahil et al., 2024). The challenge is also reflected in a survey showing that only about a quarter of prospective physics teachers at an Indonesian Islamic university reached the high category in their ability to design integrated learning tools (Umar & Sukarno, 2022). Second, attempts to establish integration by matching Qur'anic statements with scientific theories have been subject to methodological criticism (Mir, 2004; Guessoum, 2008; see also Guessoum & Bigliardi, 2023). This criticism raises an important question: if the contribution of the Qur'an to science education is not primarily the provision or confirmation of scientific theories, what other dimensions of scientific learning can be informed by its teachings? Third, studies of the two passages have generally examined them separately, while discussions of *qawliyyah* and *kawniyyah* have largely developed independently at the levels of epistemology and curriculum integration (Al Jauhari et al., 2023; Abdullah, 2015). Similarly, the Qur'anic concept of knowledge has been examined as a broader epistemological theme (Sumarno et al., 2023). The literature reviewed for this study therefore reveals limited attention to the development of an educational framework that brings these two complementary passages together through primary exegetical sources while distinguishing between exegetical findings and their subsequent pedagogical implications. Addressing this limitation constitutes the central contribution of the present article.

The theoretical significance of bringing *qawliyyah* and *kawniyyah* together lies in understanding revelation and the natural world as complementary dimensions of human engagement with knowledge. Within Islamic thought, both are understood as signs (*āyāt*) originating from the same God, although they are encountered through different forms of engagement: revelation through divine speech and the natural world through reflection on creation (Al Jauhari et al., 2023; Ozalp, 2026). This distinction provides a conceptual basis for understanding *qawliyyah* and *kawniyyah* not as competing sources of knowledge, but as complementary dimensions that contribute to a more integrated understanding of reality. Such a perspective offers a way to address the dichotomy between religious and scientific knowledge without reducing one to the other. It is consistent with the call for an integrated and interconnected relationship among Islamic, natural, social, and cultural sciences (Abdullah, 2015), as well as with the view that education grounded in a Qur'anic worldview should shape how learners perceive and understand the world, rather than merely determine what they memorize (Iqbal, 2012). This orientation is also consistent with foundational discussions in Islamic educational thought, which regard education as a matter of purpose and worldview rather than technique alone (Al-Attas, 1980). In science and technology education, such integration concerns not only the content of learning but also the intellectual orientation, awareness, and responsibility that accompany the acquisition and application of knowledge.

The selection of these two passages is based on their complementary textual and educational emphases. QS al-ʿAlaq [96]: 1–5 is widely regarded as the first revelation and brings together, within five verses, the command to read, the invocation of the Lord, the creation of human beings, the pen, and divine teaching. These elements provide a textual basis for examining the relationship between literacy, learning, and the acquisition of knowledge within a framework of divine guidance. Meanwhile, QS al-Ghāsyiyah [88]: 17–20 is particularly relevant because it explicitly directs human attention toward concrete natural phenomena through the expression *afalā yanẓurūn* and the repeated interrogative *kayfa*. By presenting the camel, the sky, the mountains, and the earth as objects of reflection, the passage provides a basis for examining the intellectual engagement with nature. The first passage thus emphasizes the process and

orientation of learning, while the second emphasizes the contemplation of the natural world. Their complementary emphases, together with their established presence in Islamic educational discourse, make them a suitable textual basis for developing an integrated perspective on science and technology education.

The starting point of this article is not the question of whether these verses contain modern scientific knowledge, but how they provide foundations for an orientation toward knowledge and the natural world. Accordingly, the article has three objectives: (1) to analyze the educational dimensions of QS al-ʿAlaq [96]: 1–5 concerning literacy and the acquisition of knowledge; (2) to analyze the educational dimensions of QS al-Ghāsyiyah [88]: 17–20 concerning reflection on and observation of nature; and (3) to formulate a conceptual framework for integrating *qawliyyah* and *kawniyyah* in science and technology education based on the analysis of both passages, together with its implications for educational practice.

These objectives are guided by three research questions. (RQ1) How are literacy and the pursuit of knowledge encouraged in QS al-ʿAlaq [96]: 1–5? (RQ2) How is reflection on and observation of nature encouraged in QS al-Ghāsyiyah [88]: 17–20? (RQ3) How can these two groups of verses provide a basis for integrating *qawliyyah* and *kawniyyah* in science and technology education, and what are the implications of this integration for curriculum, teaching, and Islamic educational institutions?

Method (منهج)

This study employs a qualitative library research design using textual, exegetical, and pedagogical analysis. The analysis is conducted in three interrelated stages. The first stage involves textual analysis of the selected Qur'anic passages, focusing on their lexical, morphological, and syntactic features. In QS al-ʿAlaq [96]: 1–5, particular attention is given to the expressions *iqraʾ, bi-smi rabbik, qalam, and ʿallama,* including their linguistic functions and relationships within the verses. In QS al-Ghāsyiyah [88]: 17–20, the analysis focuses on the expression *afalā yanẓurūn*, the natural objects mentioned in the passage, and the repetition of the interrogative *kayfa*. This stage aims to identify the textual features relevant to the themes of knowledge acquisition and reflection on nature without prematurely assigning them specific modern educational meanings.

The second stage involves exegetical analysis, in which the textual findings are examined in light of selected classical and contemporary Qur'anic commentaries. The sources consist of the works of al-Ṭabarī, al-Qurṭubī, Ibn Kathīr, Muḥammad ʿAbduh (*Tafsīr Juzʾ ʿAmma*), Wahbah al-Zuḥaylī (*al-Tafsīr al-Munīr*), and M. Quraish Shihab (*Tafsir al-Mishbah*). These commentaries are selected to provide a range of interpretive perspectives across different periods and exegetical traditions. Their explanations are examined comparatively to identify points of convergence, differences in emphasis, relevant contextual considerations, and the interpretive boundaries of each passage. Secondary academic studies are used to contextualize the discussion and engage with existing scholarship, particularly in relation to Islamic epistemology and education, rather than replacing the primary exegetical sources.

The third stage involves pedagogical analysis, through which the textual and exegetical findings are developed into conceptual implications for science and technology education within the *qawliyyah–kawniyyah* framework. This analysis focuses on the relationship between the acquisition of knowledge through reading and learning, on the one hand, and intellectual engagement with the natural world through observation and reflection, on the other. The resulting implications are considered in relation to educational orientation, learning activities,

and the integration of knowledge in educational practice. This stage constitutes the authors' analytical extension and is distinguished from the meanings established through textual and exegetical analysis. Table 1 in the Results and Discussion section summarizes the distinction between the Qur'anic text, exegetical interpretations, and the pedagogical implications developed in this study.

The two Qur'anic passages were purposively selected on the basis of their textual and conceptual relevance to the research objectives. From a textual perspective, QS al-ʿAlaq [96]: 1–5 contains expressions related to reading, divine teaching, and the means of transmitting knowledge, while QS al-Ghāsyiyah [88]: 17–20 directs attention toward natural phenomena through an explicit invitation to observe and reflect. From a conceptual perspective, the two passages offer complementary emphases on the acquisition of knowledge and engagement with the natural world, making them suitable for examining the relationship between *qawliyyah* and *kawniyyah* in science and technology education. Their frequent use in Islamic educational discourse further supports their relevance to the present inquiry.

Methodologically, this study adopts a thematic-educational (*tarbawī*) approach (Surahman, 2019), rather than claiming to apply the complete procedures of *tafsīr mawḍū'ī*, which would require the systematic collection and examination of all Qur'anic verses relevant to a particular theme. This distinction is important because critical studies of thematic exegesis have warned that verse selection without clearly established criteria may lead researchers to use Qur'anic texts merely to justify themes predetermined by their own assumptions (Ansyori et al., 2025). To address this concern, the selection of the passages is explicitly grounded in their textual features and their complementary relevance to the research questions, while their interpretation is examined through selected exegetical sources before pedagogical implications are developed. Accordingly, the findings are limited to the two groups of verses examined and should not be understood as an exhaustive representation of the Qur'an's entire perspective on knowledge, nature, or science and technology education. The pedagogical framework proposed in this article is therefore presented as a conceptual development based on these passages, rather than as the only possible educational application of their teachings.

Result and Discussion (مناقشة و نتائج)

Reading as the Beginning of Knowledge Education:

QS al-ʿAlaq [96]: 1–5 reads:

اِقْرَأْ بِاسْمِ رَبِّكَ الَّذِيْ خَلَقَۚ ۝ خَلَقَ الْاِنْسَانَ مِنْ عَلَقٍۚ ۝ اِقْرَأْ وَرَبُّكَ الْاَكْرَمُۙ ۝ الَّذِيْ عَلَّمَ بِالْقَلَمِۙ ۝ عَلَّمَ الْاِنْسَانَ مَا لَمْ يَعْلَمْۗ

"(1) Recite in the name of your Lord who created (2) Created man from a clinging substance. (3) Recite, and your Lord is the most Generous (4) Who taught by the pen (5) Taught man that which he knew not."

QS al-ʿAlaq [96]: 1–5 begins with the command *iqraʾ*, without explicitly specifying what is to be read. The exegetes offer different explanations of its implied object. al-Qurṭubī understands it as referring to what was revealed to the Prophet, to be recited while invoking the name of God (p. 376), whereas al-Ṭabarī emphasizes the command to read while mentioning God's name (p. 527). ʿAbduh offers a different interpretation, understanding the command as an *amr takwīnī*, namely, the creation of the ability to read in the person of the unlettered Prophet (pp. 122–123). Shihab questions this interpretation because the Prophet's response and his continued status as *ummī* do not support the assumption that the command immediately established his ability to

read (p. 393). Instead, Shihab draws on the linguistic principle that a verb requiring an object but occurring without an explicitly stated object may carry a general scope. Accordingly, he understands *iqraʾ* as encompassing the reading and study of the universe, society, and the self, in addition to written texts, whether sacred or otherwise. He also associates the root *qaraʾa* with the meaning of gathering or combining (pp. 392–393).

These interpretations indicate that the unspecified object of *iqraʾ* has been understood differently within the exegetical tradition. The reading of revelation remains a central interpretation, while Shihab extends its scope to include the study of the natural and social worlds. This broader understanding should be recognized as Shihab's exegetical position rather than treated as the explicit wording of the verse or a consensus among the commentators. From an educational perspective, however, the command provides a basis for understanding reading as an essential activity in the pursuit of knowledge. Shihab further observes that the repetition of *iqraʾ* in verse 3 suggests that repeated reading can produce new understanding even when the object remains the same (pp. 399–400). This interpretation offers an educational insight into the cumulative character of learning, in which knowledge develops through sustained engagement with what is read.

The command to read is immediately qualified by the expression *bi-smi rabbik*, which establishes the orientation of the activity. ʿAbduh explains that mentioning God's name is intended to remind the heart, at the beginning of every action, that the action is undertaken for God rather than for any other purpose (p. 123). Shihab relates the term *rabb* to *tarbiyah*, understood as the process of developing and improving creation, and interprets the connection between reading and the name of God as an encouragement to undertake this activity for His sake (pp. 394–395). al-Zuḥaylī likewise emphasizes the significance of *rabb* as one of the attributes associated with divine action (*ṣifāt al-fiʿl*), arguing that this designation reinforces the obligation of obedience (p. 705). Taken together, these interpretations indicate that the pursuit of knowledge is not presented as an activity detached from religious consciousness. The expression *bi-smi rabbik* places reading within an orientation shaped by awareness of God and the purpose of human action. For education, this means that the acquisition of knowledge involves not only intellectual activity but also consideration of the orientation and purposes underlying that activity.

The passage subsequently introduces the *qalam*, or pen, as a means of teaching. The exegetes generally understand it as an instrument through which knowledge is recorded and transmitted. al-Ṭabarī interprets it as the means by which human beings are taught writing, citing Qatādah's observation that the pen is a great blessing without which religion and worldly life could not be sustained (p. 527). Ibn Kathīr identifies three forms in which knowledge is represented: what exists in the mind, what is expressed through speech, and what is preserved in writing. He emphasizes the importance of writing because it can preserve knowledge in a form that is not dependent solely on memory or oral transmission (pp. 436–437). al-Zuḥaylī develops this function further, explaining that writing preserves knowledge and information, records the experiences of earlier generations, and enables knowledge to be transmitted across communities and generations so that it can remain available for further development (p. 706). These interpretations present the *qalam* as an important means of preserving and transmitting knowledge. Its educational significance lies not only in recording what has been learned but also in making knowledge accessible for subsequent examination, development, and dissemination. In contemporary education, this function may be extended by analogy to other media used to store and transmit knowledge, including digital technologies. Such an extension, however, concerns the functional similarity of these media and should not be confused with the explicit lexical meaning of *qalam* in the verse.

Verse 5 further emphasizes the divine origin of human knowledge through the expression *ʿallama al-insāna mā lam yaʿlam* (He taught the human being what he did not know). God is presented as the one who teaches, while the human being is the recipient of knowledge. ʿAbduh emphasizes that human beings initially possess no knowledge and that their subsequent acquisition of knowledge is therefore a divine gift (p. 124). In *al-Tafsīr al-Munīr*, al-Zuḥaylī explains that divine teaching includes the granting of intellectual capacities, the establishment of evidence, the revelation of signs, and the teaching of things that human beings may learn through experience and practice, including writing and practical skills (*ṣināʿah*) (p. 703). The verse thus presents knowledge acquisition as a movement from not knowing to knowing, while emphasizing human dependence on divine teaching. From an educational perspective, this provides a basis for intellectual humility: knowledge should not be treated as an absolute possession that makes human beings independent of their Creator, but as a capacity and opportunity that entails awareness of its source and limitations.

This understanding can also be considered in relation to verses 6–7, although their historical context must be distinguished from that of the first five verses. As noted by ʿAbduh (p. 122), Shihab (p. 402), and al-Zuḥaylī (p. 700), these later verses were revealed at a different stage. The expression *kallā inna al-insāna layaṭghā an raʾāhu istaghnā* associates human transgression with the perception of self-sufficiency. The exegetical tradition connects this passage with the conduct of Abū Jahl and understands *ṭughyān* as exceeding proper limits because of a sense of independence (al-Zuḥaylī, p. 704). Nevertheless, ʿAbduh relates this warning to the broader theme of human dependence on God: although knowledge and other capacities are divine gifts, human beings may become heedless and transgress when they regard themselves as self-sufficient (p. 124). al-Zuḥaylī also cites al-Rāzī's observation that the opening of the surah emphasizes knowledge, whereas its later part addresses wealth and the dangers associated with it (p. 709). This connection is considered here as a thematic reading of the surah's broader structure, not as an extension of the historical occasion of revelation of the first five verses. Its application to scientific and technological capabilities is the authors' conceptual analogy: the development of knowledge and technology may generate significant benefits, but it also requires awareness of human dependence, limitations, and responsibility. This implication is developed further in the discussion of science and technology education.

A comparison of the commentaries reveals differences in emphasis while also identifying several points of convergence. al-Ṭabarī and al-Qurṭubī concentrate primarily on the object of *iqraʾ* and its connection with invoking God's name. Ibn Kathīr draws attention to the preservation of knowledge through writing, while the contemporary commentators develop additional dimensions of the passage. ʿAbduh emphasizes the initial ignorance of human beings and their dependence on divine gifts; al-Zuḥaylī elaborates on the forms of knowledge and skills taught by God; and Shihab highlights the broader possible scope of reading. Despite these differences, their interpretations provide three significant educational insights. First, knowledge acquisition should be accompanied by an awareness of human dependence on divine teaching. Second, reading and writing are essential means through which knowledge is acquired, preserved, and transmitted. Third, the expression *bi-smi rabbik* places the pursuit of knowledge within an orientation shaped by consciousness of God. The differences among the commentators, particularly regarding the object of *iqraʾ*, also demonstrate why the extension of reading to the natural and social worlds must be attributed to the relevant exegetical interpretation rather than presented as an explicit statement shared by all commentators.

QS al-ʿAlaq [96]: 1–5 therefore provides a foundation for understanding how human beings acquire and develop knowledge through reading, writing, and learning within an orientation of

divine consciousness. Although the passage does not explicitly specify the object of reading, Shihab's interpretation allows its educational implications to extend to the study of the natural and social worlds. The explicit invitation to direct attention toward concrete natural phenomena, however, is articulated more directly in another passage, namely QS al-Ghāsyiyah [88]: 17–20.

Observing Nature as a Path to Knowledge

QS al-Ghāsyiyah [88]: 17–20 reads:

اَفَلَا يَنْظُرُوْنَ اِلَى الْاِبِلِ كَيْفَ خُلِقَتْۗ ۝ وَاِلَى السَّمَاۤءِ كَيْفَ رُفِعَتْۗ ۝ وَاِلَى الْجِبَالِ كَيْفَ نُصِبَتْۗ ۝ وَاِلَى الْاَرْضِ كَيْفَ سُطِحَتْۗ

"(17) Then do they not look at the camels - how they are created? (18) And at the sky - how it is raised? (19) And at the mountains - how they are erected? (20) And at the earth - how it is spread out?"

If QS al-ʿAlaq [96]: 1–5 provides a basis for understanding the orientation and means of acquiring knowledge, QS al-Ghāsyiyah [88]: 17–20 directs attention toward the natural world as an object of reflection. Before deriving educational implications, however, the exegetical function of these verses must first be established. The exegetes relate this passage to the rejection of the Prophet's descriptions of the conditions of Paradise, as reported by al-Ṭabarī and al-Qurṭubī through a narration from Qatādah (al-Ṭabarī, pp. 338–339; al-Qurṭubī, p. 250). The verses respond by directing attention toward existing creations as evidence of divine power: the One who created these things is certainly not incapable of bringing about what He has promised (al-Ṭabarī, p. 338). al-Zuḥaylī similarly presents the passage as establishing God's power over resurrection (pp. 594–598), while Shihab relates it to the response to those who doubted God's ability to reassemble decayed bones (p. 234). ʿAbduh, meanwhile, emphasizes that the verses direct people toward the signs of divine power present in their surroundings (pp. 75–76). The primary function of this passage is therefore an argument concerning God's power and resurrection. Its educational implications should be developed within this exegetical context rather than by treating the verses as a direct presentation of modern scientific methods.

The passage begins with the expression *afalā yanẓurūn*, which directs attention toward the objects mentioned in the following verses. The verb *naẓara* is followed by the preposition *ilā*, indicating the object toward which attention or sight is directed. al-Ṭabarī explains this expression in terms of deriving a lesson from the object observed (p. 338), while al-Zuḥaylī describes it as *naẓar iʿtibār*, an act of observation intended to produce reflection and instruction (pp. 594–598). A study employing Izutsu's semantic framework likewise indicates that the meaning of *naẓara* extends beyond the mere act of seeing with the eyes (Adam & Nugroho, 2023). Shihab offers an additional rhetorical interpretation of the construction *naẓara ilā*, understanding it as an invitation to direct attention comprehensively toward the indicated object (p. 234). This explanation represents Shihab's interpretation of the expression in this context rather than a universal lexical rule governing every occurrence of *naẓara ilā*. Taken together, the textual construction and exegetical explanations indicate that the verses call for directed attention toward concrete objects, with the purpose of drawing lessons from their existence and characteristics. The emphasis is therefore not merely on seeing but on observing in a manner that leads to reflection.

The objects mentioned in the passage also contribute to its significance: the camel, the sky, the mountains, and the earth. The exegetes generally explain their selection by referring to their familiarity and accessibility to the first audience of the Qur'an. Ibn Kathīr describes how the Bedouins were directed to draw evidence from the camel they rode, the sky above them, and the mountains surrounding them (pp. 387–389). al-Zuḥaylī similarly regards these objects as readily accessible to observation (pp. 594–598). al-Qushayrī, as cited by al-Qurṭubī, illustrates the

sequence through the experience of a traveler riding alone on a camel, observing the animal that carries him before directing his gaze toward the sky and the earth (p. 253). Shihab also relates the sequence to the circumstances and environment of the society first addressed by the Qur'an (p. 235). Although some linguists have interpreted *al-ibil* as referring to clouds, Shihab records this as an uncommon interpretation, while al-Māwardī, as cited by al-Qurṭubī, considers the meaning of camels to be the more evident interpretation (Shihab, p. 235; al-Qurṭubī, p. 251). These explanations indicate that the passage directs attention toward objects that were familiar and tangible to its initial audience. From an educational perspective, this offers an insight into the value of beginning learning with concrete phenomena that can be encountered and examined within the learner's environment. Such an application is a pedagogical implication of the passage rather than an explicit instructional method prescribed by it.

The exegetical tradition also preserves reports indicating that these verses were understood as an invitation to actual observation. al-Ṭabarī, al-Qurṭubī, and Ibn Kathīr transmit a statement attributed to Shurayḥ al-Qāḍī encouraging people to go outside and observe the camel and the manner of its creation (al-Ṭabarī, p. 339; al-Qurṭubī, p. 252; Ibn Kathīr, pp. 387–389). Although this report does not establish a formal research procedure or turn the passage into a scientific investigation, it provides an indication that the invitation to observe was understood as involving actual engagement with the objects of creation rather than merely acknowledging their existence. Its relevance to education lies in the importance of direct attention to concrete realities as a basis for reflection.

Another significant feature of the passage is the repetition of the interrogative *kayfa: kayfa khuliqat, kayfa rufiʿat, kayfa nuṣibat,* and *kayfa suṭiḥat*. In its syntactic context, *al-Tafsīr al-Munīr* explains *kayfa* as functioning as a *ḥāl*, while the clause *kayfa khuliqat* functions as a *badal ishtimāl* of *al-ibil* (pp. 594–598). The repeated interrogative therefore directs attention to the condition or manner associated with each object: how the camel was created, how the sky was raised, how the mountains were erected, and how the earth was spread out. The exegetes understand these expressions as drawing attention to the wonder of creation and its indication of divine power. In discussing the camel, for example, Ibn Kathīr and al-Zuḥaylī refer to its strength, endurance, and usefulness to human beings (Ibn Kathīr, pp. 387–389; al-Zuḥaylī, pp. 594–598). ʿAbduh, however, provides an important qualification: human beings do not know the manner in which these creations originally came into existence but can observe their existing conditions. In his interpretation, the question *kayfa* does not necessarily invite an investigation into the original process of creation; rather, it directs attention toward the observable state of created things and their significance as evidence of divine power (pp. 75–76). A study of interrogative forms in this surah likewise indicates that questions may function rhetorically to stimulate curiosity and encourage reflection rather than simply request information (Nasrudin & Nadia, 2016). These explanations suggest that the repeated *kayfa* sustains attention on the characteristics and conditions of the objects mentioned, while the theological purpose of this attention remains central to the passage.

A comparison of the commentaries reveals a consistent relationship between the theological function of the passage and its observational dimension. The classical sources, particularly al-Ṭabarī, al-Qurṭubī, and Ibn Kathīr, emphasize the argument for divine power and resurrection, illustrating it through the characteristics of the objects mentioned. The contemporary commentators retain this central function while elaborating on the linguistic and contextual features of the passage. al-Zuḥaylī emphasizes *naẓar iʿtibār*, Shihab discusses the rhetorical function of directing attention toward the objects, and ʿAbduh clarifies the limits of understanding *kayfa* as a question about the original process of creation. What emerges from these

interpretations is not a prescribed program of empirical research but an intellectual disposition toward attentive observation and reflection. This distinction is essential because the passage's educational relevance should not be established by attributing modern research procedures to the Qur'anic text.

The structure of the verses suggests two closely related intellectual movements: directing attention toward concrete objects and sustaining that attention through reflection on their conditions and characteristics. These movements are closely grounded in the textual and exegetical evidence. The subsequent development of questions, systematic investigation, and explanatory understanding constitutes the authors' pedagogical extension rather than an explicit sequence prescribed by the verses. Neither the Qur'anic text nor the exegetical sources examined here specifies procedures for designing observations, formulating hypotheses, testing explanations, or evaluating empirical evidence. Instead, the passage provides an orientation toward concrete realities and encourages reflection on their characteristics as signs of divine power. This orientation can inform a culture of observation and inquiry in science education, while the specific procedures of scientific investigation remain grounded in the methods and standards of the relevant disciplines.

The two groups of verses consequently offer complementary educational emphases. QS al-ʿAlaq [96]: 1–5 highlights reading, writing, and learning within an orientation of consciousness of God, while QS al-Ghāsyiyah [88]: 17–20 directs attention toward the natural world through observation and reflection. The first provides a basis for understanding the orientation and means of acquiring knowledge, whereas the second illustrates how attention may be directed toward the signs of creation. Their relationship is complementary rather than exhaustive: neither passage alone represents the entirety of Qur'anic epistemology, and their educational implications should remain grounded in their respective textual and exegetical contexts. The relationship between these dimensions can be further examined through the conceptual distinction between *qawliyyah* and *kawniyyah*.

Before the two passages are brought together, Table 1 distinguishes three levels of analysis: the textual features and surah context of each passage, their interpretation in selected exegetical sources, and the pedagogical implications developed by the authors. It also specifies the limits of these pedagogical extensions to prevent them from being presented as meanings explicitly stated in the Qur'anic text or established directly by the exegetical tradition.

Table 1. Distinguishing Textual, Exegetical, and Pedagogical Levels of Analysis

Level	QS al-ʿAlaq [96]: 1–5	QS al-Ghāsyiyah [88]: 17–20
Text and surah context	Opens with *iqraʾ*, with no object specified, followed by *bi-smi rabbik, qalam,* and *ʿallama al-insāna mā lam yaʿlam*. The passage is traditionally associated with the beginning of revelation.	A rhetorical question, *afalā yanẓurūn*, directs attention to the camel, the sky, the mountains, and the earth, each introduced through the repeated question *kayfa*. The passage occurs within a broader discussion of divine power and resurrection.
Exegetical meaning	Reading is understood in relation to God's name and the orientation of human learning (ʿAbduh; Shihab). The *qalam* is interpreted as a means of teaching, recording, and preserving knowledge (al-Ṭabarī; Ibn Kathīr; al-Zuḥaylī). Knowledge	The passage functions as an argument for God's power and resurrection (al-Ṭabarī; al-Zuḥaylī; Shihab; ʿAbduh). The invitation to *naẓar* includes reflective consideration and the drawing of lessons (*naẓar iʿtibār*; al-Ṭabarī; al-Munīr). A report attributed

	is presented as something taught by God (ʿAbduh; al-Zuḥaylī). Al-Qurṭubī identifies revelation as the object of *iqraʾ*, while Shihab discusses the broader implications of its unspecified object.	to Qatādah, cited by al-Ṭabarī and al-Qurṭubī, relates the passage to the reaction of those who questioned the description of Paradise. In ʿAbduh's interpretation, the repeated *kayfa* directs attention to the observable conditions of created objects rather than explicitly describing their underlying processes.
Pedagogical application (authors' extension)	Provides an orientation and a mode of acquiring knowledge: reading, writing, and learning as purposeful and cumulative activities. It also supports a broader conception of literacy that includes preserving, evaluating, and verifying information.	Encourages a disposition of directed attention to concrete natural phenomena and reflection on their conditions and characteristics. This provides a pedagogical basis for developing observation- and inquiry-based learning.
Limits of the claim	Extending the function of the *qalam* to digital media is an analogy, not its lexical meaning. Likewise, applying the warning against *ṭughyān* in verses 6–7 to technological use is the authors' pedagogical and ethical extension.	The verses do not prescribe a systematic sequence of observing, questioning, investigating, and understanding. They invite attention and reflection through a rhetorical question; translating this invitation into structured scientific inquiry is a pedagogical extension. The procedures of investigation are supplied by the relevant scientific disciplines.

Bringing Qawliyyah and Kawniyyah Together in Science and Technology Education

In Islamic thought, the distinction between *qawliyyah* and *kawniyyah* provides a conceptual framework for understanding the relationship between divine revelation and the natural world. The term *āyah* refers to a sign, and the distinction commonly made between *āyāt qawliyyah* and *āyāt kawniyyah* refers to God's signs as expressed through revelation and manifested in creation, respectively (Al Jauhari et al., 2023). In the thought of Said Nursi, the Qur'an as the book of revelation and nature as the book of creation are understood as complementary signs originating from the same God (Ozalp, 2026). Within this framework, both QS al-ʿAlaq [96]: 1–5 and QS al-Ghāsyiyah [88]: 17–20 belong to the category of *qawliyyah*, since both are revealed passages of the Qur'an. However, QS al-Ghāsyiyah directs human attention toward *kawniyyah* signs through its references to the camel, the sky, the mountains, and the earth. The distinction, therefore, is not between the two Qur'anic passages themselves, but between revelation as a form of divine signs and the created realities to which revelation directs human attention.

This distinction clarifies what is meant by integrating *qawliyyah* and *kawniyyah* in education. The integration does not involve treating two groups of Qur'anic verses as separate sources of knowledge, but understanding the complementary relationship between revelation and the natural world as two dimensions of human engagement with reality. Revelation is read, understood, and interpreted, while the natural world is observed and investigated through appropriate methods of inquiry. The former provides theological orientation, values, and guidance for understanding the purpose of knowledge, while the latter offers a field for empirical observation and the development of knowledge about created phenomena. These contributions are distinct but complementary. Revelation is not examined in the same manner as natural phenomena, and empirical observation does not independently provide the same theological and

ethical orientation as revelation. Education provides a setting in which these dimensions can inform one another without erasing their respective characteristics.

The significance of this integration becomes clearer when distinguished from two practices that have frequently been associated with the integration of religion and science. The first is the symbolic insertion of Qur'anic verses into science lessons without allowing them to influence the objectives, processes, or evaluation of learning. As Ghofur et al. (2021) observe, the inclusion of verses in classroom displays does not necessarily change how students understand and engage with knowledge. The second practice involves matching Qur'anic statements with particular scientific theories. Mustansir Mir (2004) cautions against making the interpretation of revelation dependent on scientific theories that may subsequently change. Guessoum (2008) proposes a *no-conflict* principle, arguing that Muslim scientists do not need to demonstrate that a particular scientific theory is explicitly contained in the Qur'an; rather, they should avoid unnecessary claims that equate scientific theories with the meaning of revelation. Guessoum (2011) similarly warns that rigid literalism in Qur'anic interpretation may obstruct serious engagement with science. A study of Qur'anic vocabulary concerning the earth also argues that Qur'anic language should not be treated as establishing a particular cosmological model (Akhyar et al., 2025). The present article follows this critical position. Integration is therefore understood as the complementary engagement of revelation and empirical inquiry: revelation contributes theological and ethical orientation, scientific disciplines provide methods for investigating natural phenomena, and education connects these dimensions through meaningful learning experiences. Technology, as an application of knowledge, is consequently considered in relation to the benefits and responsibilities associated with its development and use.

The position of technology within this framework requires particular caution. Neither QS al-ʿAlaq [96]: 1–5 nor QS al-Ghāsyiyah [88]: 17–20 explicitly discusses technology in its modern sense. Their relevance to technology education is therefore located at the level of pedagogical implications rather than direct textual instruction. Knowledge acquired through reading, learning, observation, and investigation may be applied to develop technological solutions, while the theological and ethical orientation provided by revelation can inform decisions concerning their purposes and consequences. The exegetical tradition offers a limited indication of the relationship between knowledge and practical capabilities. In explaining *ʿallama al-insāna mā lam yaʿlam*, al-Zuḥaylī includes practical skills (*ṣināʿah*) alongside writing among the things taught to human beings (p. 703). This interpretation suggests that the acquisition of knowledge may encompass practical abilities, although it does not establish a direct equivalence between *ṣināʿah* and modern technology. The connection between the Qur'anic passages and technology education should therefore be understood as an educational development based on the relationship between knowledge, practical application, and responsibility.

Within these conceptual boundaries, the integration of *qawliyyah* and *kawniyyah* can be developed into a five-stage educational framework, as illustrated in Figure 1 and summarized in Table 2. The first two stages represent the complementary dimensions derived from the selected Qur'anic passages and their exegetical interpretations, whereas stages three to five constitute the authors' pedagogical development. The framework is designed as a conceptual structure for organizing science and technology education rather than as a fixed or universal sequence of scientific knowledge production.

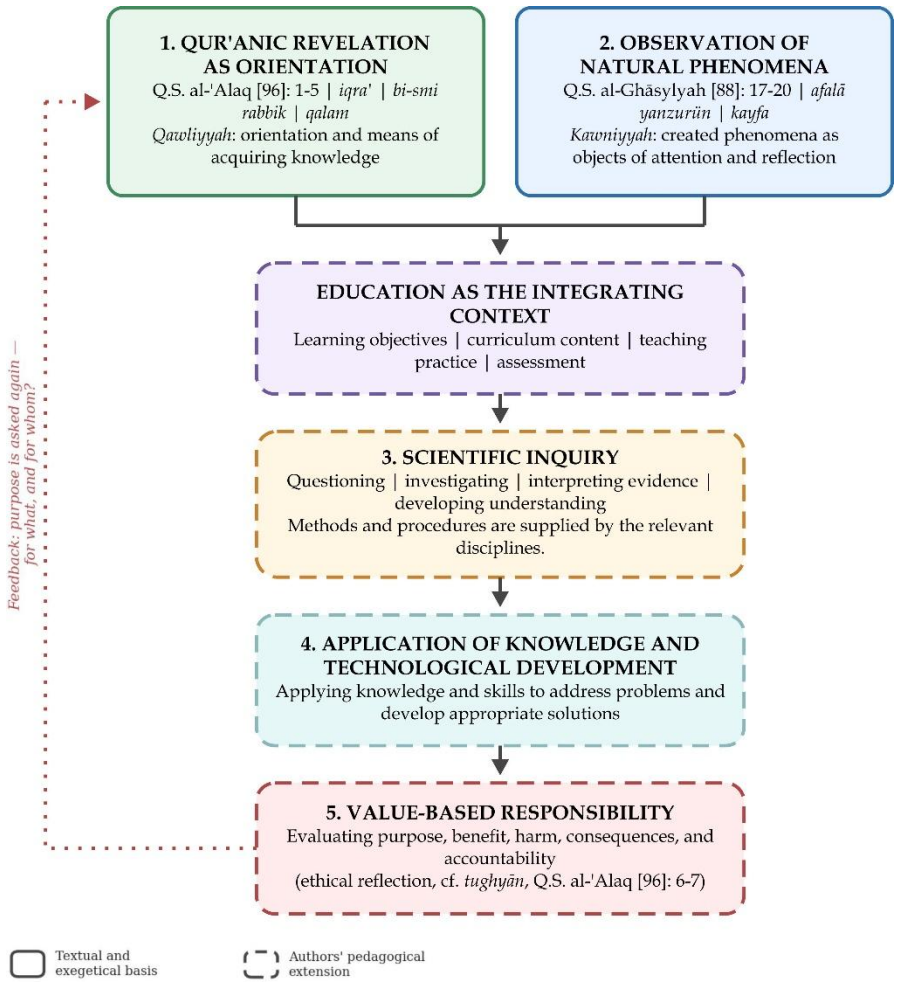

Figure 1. Conceptual framework integrating *qawliyyah* and *kawniyyah* in science and technology education

Table 2. Five stages of the qawliyyah–kawniyyah framework for science and technology education

No	Stage	Basis	Educational implication
1	**Revelation as orientation (*qawliyyah*)**	QS al-ʿAlaq [96]: 1–5: *iqraʾ, bi-smi rabbik, qalam,* and *ʿallama*	Establishing learning purposes and developing literacy through reading, writing, preserving, and evaluating knowledge
2	**Observation of nature (*kawniyyah*)**	QS al-Ghāsyiyah [88]: 17–20: *yanẓurūn* and the repeated *kayfa*	Guided observation of concrete natural phenomena and reflection on their characteristics
3	**Scientific inquiry**	Authors' pedagogical extension; methods supplied by relevant disciplines	Formulating questions, investigating phenomena, analyzing evidence, and evaluating explanations
4	**Application of knowledge and**	Authors' pedagogical extension; practical skills	Applying knowledge to address problems and develop

	technological development	(*ṣināʿah*) mentioned in al-Munīr	appropriate solutions or technologies
5	**Value-based responsibility**	Authors' analogy from the warning against *ṭughyān* in QS al-ʿAlaq [96]: 6–7	Evaluating purposes, benefits, risks, consequences, and accountability in the use of knowledge and technology

The first stage is revelation as an orientation for knowledge acquisition (*qawliyyah*). Drawing on QS al-ʿAlaq [96]: 1–5, particularly the expressions *iqraʾ, bi-smi rabbik, qalam,* and *ʿallama*, this stage emphasizes reading, learning, and the preservation of knowledge within an awareness of God. Its educational function is not to replace scientific methods with religious texts, but to establish a theological and ethical orientation toward the pursuit of knowledge. In classroom practice, this orientation may be expressed through learning objectives that encourage students to understand not only what they are learning but also why knowledge matters and how it should be used.

The second stage is observation of nature (*kawniyyah*). Based on QS al-Ghāsyiyah [88]: 17–20, particularly the expressions *afalā yanẓurūn* and the repeated *kayfa*, this stage emphasizes attentive engagement with concrete natural phenomena. Its exegetical basis lies in the interpretation of *naẓar iʿtibār*, which connects observation with reflection and the derivation of lessons. Pedagogically, this stage encourages students to engage with observable phenomena in their immediate environment and to consider their characteristics and conditions. The relationship between the first and second stages is complementary rather than strictly sequential: revelation provides orientation for engagement with the natural world, while observation gives learners concrete phenomena through which their understanding can develop.

The third stage is scientific inquiry. This stage represents the authors' pedagogical extension and is not presented as an explicit research procedure prescribed by either passage. It develops the observational disposition into more systematic forms of investigation, including formulating questions, proposing hypotheses where appropriate, gathering and analyzing evidence, and evaluating explanations. The specific procedures are determined by the methods and standards of the relevant scientific disciplines. In this way, the Qur'anic encouragement to observe and reflect can inform the intellectual orientation of scientific learning without being treated as a substitute for empirical methodology.

The fourth stage is the application of knowledge and technological development. This stage concerns the use of knowledge gained through learning and inquiry to understand problems, develop solutions, and, where appropriate, produce technological applications. Its connection to the selected passages is indirect and belongs to the authors' pedagogical development. The mention of practical skills (*ṣināʿah*) in al-Zuḥaylī's interpretation of QS al-ʿAlaq [96]: 5 provides a limited exegetical indication that divine teaching encompasses practical human capabilities (p. 703). However, this does not establish a direct equivalence between the verse and modern technological development. Rather, it supports the broader educational consideration that knowledge can extend into practical abilities and applications.

The fifth stage is value-based responsibility. This stage completes and simultaneously informs the preceding stages by bringing the question of purpose back into the evaluation of knowledge and its applications. Its conceptual basis includes the warning against human transgression through a sense of self-sufficiency in QS al-ʿAlaq [96]: 6–7, which the exegetes associate with the attitude of exceeding proper limits. Extending this warning to scientific and technological capabilities is the authors' analogy rather than a direct interpretation of the first five

verses. Within this framework, responsibility involves considering the purposes, benefits, potential harms, and consequences of applying knowledge. Students are therefore encouraged to evaluate not only whether a technological solution works but also whom it benefits, what risks it creates, and how its use can be made accountable.

Five relationships connect these stages. First, the dimensions of *qawliyyah* and *kawniyyah* are complementary: revelation provides theological and ethical orientation, while the natural world provides the field of empirical engagement. Second, education connects these dimensions by translating their respective contributions into learning objectives, classroom activities, and assessment. Third, scientific inquiry develops observation into systematic investigation, with its procedures remaining grounded in the relevant disciplines. Fourth, the application of knowledge may lead to technological development and practical problem-solving. Fifth, value-based responsibility returns the question of purpose to the process, ensuring that the development and use of knowledge remain subject to ethical consideration. The educational implications of these relationships are elaborated in the following section and illustrated through the learning sequences in Table 3.

The proposed framework is an analytical synthesis of the two groups of Qur'anic passages and their selected exegetical interpretations, not a sequence explicitly stated in the Qur'an. In Figure 1, solid borders indicate elements grounded in the textual and exegetical analysis, while dashed borders indicate the authors' pedagogical extensions. The five stages should therefore be understood as an educational framework rather than a universal model of scientific development. Although the framework presents an organizing progression from orientation and observation to inquiry, application, and responsibility, the relationships among these activities may also be reciprocal. Technological developments, for example, can provide new instruments for scientific observation, while new empirical findings can generate further questions and applications. What remains central to the framework is that the pursuit and application of knowledge should be accompanied by both engagement with the natural world and awareness of its theological and ethical orientation.

Relevance to Science and Technology Education

The preceding analysis suggests three major implications for science and technology education. These implications represent the authors' pedagogical development of the selected Qur'anic passages and their exegetical interpretations rather than educational prescriptions explicitly stated in the verses.

The first implication concerns literacy and a culture of reading. The expressions *iqra'* and *qalam* establish reading and writing as important means of acquiring, preserving, and transmitting knowledge. As explained by Ibn Kathīr and al-Zuḥaylī, writing enables knowledge to be preserved beyond individual memory and transmitted across generations. From this perspective, literacy in science education should not be treated merely as an additional subject or as the ability to read scientific terminology. It also involves understanding information, evaluating claims, preserving findings, and communicating knowledge responsibly. In contemporary educational contexts, this understanding can be extended to information and digital literacy, particularly the ability to verify information before accepting or disseminating it (Kuswandi et al., 2026). Such an extension is consistent with research that regards literacy and science learning as mutually supportive (Pearson et al., 2010) and emphasizes the role of supported reading, writing, and communication in developing scientific literacy (Krajcik & Sutherland, 2010). The connection between digital literacy and the *qalam* is therefore a functional analogy based on the role of writing in preserving and transmitting knowledge, not an interpretation of the verse as explicitly referring to digital technology.

The second implication concerns observation- and inquiry-based learning. The expression *afalā yanẓurūn* and the repeated interrogative *kayfa* in QS al-Ghāsyiyah [88]: 17–20 direct attention toward concrete phenomena and encourage reflection on their characteristics. In science education, this orientation can be translated into learning experiences that allow students to observe phenomena, formulate questions, investigate relevant problems, and evaluate evidence. These activities constitute a pedagogical extension rather than a research procedure prescribed by the verses. Previous studies have attempted to translate Qur'anic reflection on nature into learning models, including Qur'an-based inquiry, which seeks to connect empirical investigation with a broader religious orientation (Hikmatiar et al., 2026). Research on biology teachers in Islamic schools also indicates that integration across learning objectives, content, procedures, and evaluation is more meaningful than the inclusion of religious references at the content level alone (Sahil et al., 2024). Accordingly, the educational contribution of the passage should not be reduced to quoting its verses during science lessons, but should be reflected in learning activities that genuinely engage students in observation, questioning, and evidence-based investigation.

The third implication concerns ethical responsibility in the development and use of technology. The warning against human transgression through a sense of self-sufficiency in QS al-ʿAlaq [96]: 6–7 offers an additional perspective for considering the responsibilities associated with scientific and technological capabilities. The exegetical interpretation of *ṭughyān* concerns the human tendency to exceed proper limits when regarding oneself as independent. Applying this idea to the use of science and technology is the authors' analogy, not a direct interpretation of the first five verses or a claim that technological development itself constitutes *ṭughyān*. The analogy highlights the possibility that increased knowledge and technical capabilities may be accompanied by an unjustified sense of human autonomy or a disregard for the consequences of their use. An Islamic virtue-based framework for artificial intelligence ethics, for example, emphasizes the importance of considering the purpose of technological development from its planning stage (Raquib et al., 2022). Discussions of Islamic science and education similarly connect scientific inquiry with values such as *tawḥīd*, stewardship, social justice, and the responsible use of natural resources (Arbi et al., 2023). The role of values in scientific practice is also discussed in the broader philosophy of science and science education (Koster & de Regt, 2020; Ward, 2021). Within the proposed framework, ethical responsibility therefore involves evaluating not only the technical effectiveness of a scientific or technological application but also its purposes, potential benefits, associated risks, and consequences for those affected by its use. This perspective brings the question of why knowledge is pursued, introduced through *bi-smi rabbik,* back into consideration when knowledge is applied.

Illustrative Implementation in Science and Technology Classrooms

To illustrate how the proposed framework may be translated into educational practice, Table 3 presents three examples of learning sequences in different subject areas. Each example draws on a different textual reference from the selected passages: the earth and mountains in QS al-Ghāsyiyah [88]: 19–20, the camel in verse 17, and the pen in QS al-ʿAlaq [96]: 3–5. The examples are intended as pedagogical proposals rather than findings from classroom implementation. They demonstrate how the Qur'anic orientation toward knowledge and observation can be connected with disciplinary learning objectives, scientific inquiry, practical applications, and ethical responsibility.

Table 3. Illustrative learning sequences based on the framework

No	Stage	Earth science: soil, slopes, and water	Biology: adaptation in dry habitats	Technology: information and AI

1	**Orientation (*qawliyyah*)**	Introduce *bi-smi rabbik* as a question about the purpose and responsibility involved in understanding and using the earth's resources.	Begin with a reflection on why understanding living organisms and their environments matters and how such knowledge should be used.	Relate the *qalam* to the preservation and transmission of knowledge, then ask what responsibilities accompany the creation, use, and sharing of information.
2	**Observation (*kawniyyah* and engagement with the natural world)**	Observe soil layers, slope conditions, and vegetation around the school. Record observations through sketches, measurements, and notes.	Examine camels and other organisms from dry habitats through direct observation, specimens, images, or reliable biological data. Record relevant physical characteristics.	Examine how a search engine or chatbot responds to the same question presented in different forms. Collect outputs and compare their content and consistency.
3	**Scientific inquiry**	Investigate how vegetation cover affects water runoff. Conduct a simple infiltration or erosion experiment and compare the results.	Investigate how particular biological structures support survival in dry environments. Compare examples and test a simple model, such as evaporation under different coverings.	Investigate whether changes in prompts affect AI-generated responses. Compare the outputs with reliable sources and evaluate their accuracy and supporting evidence.
4	**Application of knowledge and technological development**	Develop a proposal for managing a section of the school grounds based on the collected evidence.	Design a water-saving device or planting scheme suitable for a dry environment, using relevant biological principles.	Develop a checklist or simple tool for identifying and verifying potentially unreliable information.
5	**Value-based responsibility**	Justify the proposed land-use plan by considering its evidence, benefits, possible environmental impacts, and consequences for other people.	Evaluate the responsible use of limited water resources and consider the limitations of the proposed model or solution.	Evaluate the benefits, limitations, and potential risks of AI-generated information. Identify who may be affected and formulate guidelines for responsible use.

These examples illustrate how the five-stage framework can be adapted to different areas of science and technology education. In each case, the selected Qur'anic passages provide an orientation toward purposeful learning and attentive engagement with the world, while the procedures of investigation are derived from the relevant disciplines. The example involving information technology requires an additional distinction: unlike the camel, the sky, the mountains, and the earth, digital systems are human-developed technological products rather than *kawniyyah* signs in the same sense as natural creations. Their examination therefore represents an extension of the framework to the evaluation and application of human knowledge, rather than a direct instance of observing natural phenomena.

Assessment within this framework should consequently address more than the mastery of scientific content. It should also consider the quality of students' observations and questions, their ability to use and evaluate evidence, the appropriateness of their proposed applications, and their reasoning about purpose, benefits, and potential consequences. The implementation of such learning sequences also depends on teachers' capacity to design meaningful integration across educational objectives, content, procedures, and evaluation. This consideration is supported by a survey of prospective physics teachers at an Indonesian Islamic university, which found a significant relationship between scientific literacy and the ability to develop integrated learning tools, while only about a quarter of respondents reached the high category in this ability (Umar & Sukarno, 2022). Teacher preparation is therefore an important consideration in translating the proposed framework into educational practice.

Conclusion (خاتمة)

This article set out to analyze the educational content of QS al-ʿAlaq [96]: 1–5 and QS al-Ghāsyiyah [88]: 17–20 and to explain how the two passages can support the integration of *qawliyyah* and *kawniyyah* in science and technology education. In response to the first research question, QS al-ʿAlaq [96]: 1–5 places the acquisition of knowledge within a process of reading, writing, and learning grounded in awareness of Allah. The text does not specify the object of reading, and the exegetical tradition offers varying interpretations, ranging from revelation to a broader scope of reading. The exegetes also understand the *qalam* as a means of recording, preserving, and transmitting knowledge. These interpretations provide a basis for considering literacy and the transmission of knowledge as important dimensions of education.

In response to the second research question, QS al-Ghāsyiyah [88]: 17–20 functions in classical exegesis as an argument concerning God's power and resurrection. Its structure also offers a pedagogical implication: learners are invited to direct their attention to concrete and observable objects and to reflect on their conditions and characteristics. The repeated question *kayfa* draws attention to how these objects are formed and situated. However, procedures for systematic scientific investigation are not explicitly prescribed in the verses; they represent a pedagogical extension drawn from the invitation to observe and reflect.

In response to the third research question, the two passages offer complementary contributions to science and technology education. QS al-ʿAlaq [96]: 1–5 emphasizes the orientation and means of acquiring knowledge, while QS al-Ghāsyiyah [88]: 17–20 directs attention to created phenomena as signs of Allah's power. Both passages are *āyāt qawliyyah*, whereas the *kawniyyah* dimension refers to the created phenomena to which QS al-Ghāsyiyah points. The article's main contribution is a conceptual framework that brings together five interconnected dimensions: revelation as an orientation for learning, observation of nature, scientific inquiry, the application of knowledge and technological development, and value-based responsibility. The first two dimensions provide complementary foundations for inquiry rather than necessarily forming consecutive stages. Throughout this framework, the article distinguishes between insights grounded in the Qur'anic text and exegetical sources and the authors' pedagogical extensions. Unlike approaches that rely primarily on citing verses alongside scientific topics or matching Qur'anic statements with scientific theories, this framework shifts the focus of integration from asking "which verse fits this topic?" to asking "with what orientation, attention, and responsibility is this knowledge pursued?"

The educational implications of this framework converge on three areas: literacy and a culture of reading, observation- and inquiry-based learning, and ethical responsibility in the use

of technology. For curriculum development, these implications suggest that integration should be reflected in learning objectives, content, instructional procedures, and assessment rather than limited to the addition of Qur'anic quotations. Learning outcomes can therefore include the ability to read and evaluate information, observe and formulate questions about natural phenomena, investigate evidence through discipline-based methods, and consider the benefits, risks, and consequences of technological applications. In teaching practice, the framework can inform learning activities that connect purposeful engagement with knowledge, guided observation, scientific inquiry, practical application, and reflection on responsibility, as illustrated in Table 3. For Islamic educational institutions, this approach highlights the importance of teacher education and professional development that strengthen both scientific literacy and the capacity to design integrated learning. It also points to the need for assessment practices that recognize students' abilities to investigate, evaluate evidence, apply knowledge, and reason responsibly, rather than rewarding the reproduction of integrated content alone.

This study has several limitations. First, it is a literature-based study limited to two selected Qur'anic passages, and the selection did not follow the complete procedures of *tafsīr mawḍū'ī*. Second, the exegetical sources consulted represent a selection of classical and contemporary commentaries rather than the full exegetical tradition. Third, the educational implications and conceptual framework are derived from the authors' analysis and have not yet been empirically tested in classroom settings. Future research could therefore pursue four directions: (1) examine additional Qur'anic passages concerning knowledge and nature using explicit selection criteria and a wider range of exegetical sources; (2) assess the validity of the proposed framework through expert judgment, for example, a Delphi procedure involving Qur'anic exegetes, science educators, and scholars of Islamic education; (3) develop and test learning designs such as those presented in Table 3 through design-based research or classroom action research in schools and higher education; and (4) investigate, through quasi-experimental or mixed-methods studies, whether such learning designs improve students' observation and questioning skills, scientific literacy, and ethical reasoning about technology.

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