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A Critical Religious Education Perspective on Argumentation in Science and Religious Education

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Abstract
Argumentation is a core pedagogical strategy in education, often supported by established frameworks such as Toulmin's model. Although it is most frequently used in science education research, Toulmin articulated his model as a general framework for representing justificatory reasoning across multiple interpretive fields. However, structured approaches remain less developed in religious education (RE), which can leave students with the misconception that religious claims are merely subjective and lack intellectual rigour. This paper argues that the direct application of argumentation models used in science education to RE is inappropriate because of fundamental epistemological differences between the subjects. Applying these models without careful adaptation risks epistemic reductionism. To address this gap, the present theoretical paper develops a philosophically grounded normative framework, drawing on a conceptual and non-systematic synthesis of literature from the philosophy of science, the philosophy of religion, and educational theory. The primary contribution is a critical religious education (CRE)-informed pedagogical framework for classroom argumentation in RE, built by adapting Toulmin's argumentation model to reflect RE's epistemic characteristics. By moving beyond simple knowledge transmission toward the explicit articulation and evaluation of reasons for competing claims, this framework strengthens RE and offers a distinct strategy to transform informal, emotive, and intuitive reasoning into well-structured arguments.

Keywords Argumentation · Religious Education · Science Education · Critical Religious Education · Toulmin's Argumentation Pattern

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1 Introduction

Argumentation has become a central pedagogical strategy in science education and is widely used to foster critical thinking and conceptual understanding (Erduran et al., 2017; Jiménez-Aleixandre & Erduran, 2007). An extensive body of research has contributed to the development of structured argumentation frameworks as effective tools to enhance students' reasoning skills, scientific literacy, and epistemic agency (Erduran et al., 2005; Fan et al., 2025; Fischer et al., 2014). In particular, Toulmin's (2003) argument pattern, a foundational tool designed to analyse discourse across multiple fields, including law and ethics, has been prominently applied in science education as both an instructional framework and an analytical tool for evaluating the quality of students' arguments (Osborne et al., 2004).

In contrast, structured argumentation frameworks in RE are significantly less developed. When RE is taught primarily through descriptive and non-critical knowledge transmission, students may lack opportunities for deep and analytical engagement with fundamental questions of meaning, belief, and value. As a result, they may perceive religions as irrelevant, irrational, and purely subjective (Cooling, 2010). This reinforces the common misconception that science deals with objective facts while religion relies on subjective opinions or beliefs without evidence (Billingsley et al., 2021) and therefore lacks intellectual rigour and rationality (Wright, 2008). Such a binary can ultimately impoverish students' educational experiences and limit their epistemic insight by obscuring the distinctive forms of reasoning and justification that exist within religious and worldview traditions (Basel et al., 2014; Billingsley et al., 2021; Cooling, 1990).

This discussion is situated within the context of RE in the UK, where the subject is a statutory part of the curriculum in state-funded schools. Unlike confessional approaches aimed at faith formation, or systems where a distinct compulsory RE subject is uncommon, the UK approach generally treats RE as an academic discipline directed at building religious literacy and critical inquiry (Cooling, 2025; Shaw, 2020). This pedagogical setting provides a particularly useful context for examining how students navigate competing truth claims. Nevertheless, although the analysis is grounded in this setting, the epistemological tensions surrounding scientific and religious truth claims extend beyond the UK context. Consequently, the theoretical framework offered in this paper also has relevance for the wider science and education community, particularly for educators seeking to address the moral and worldview dimensions of socio-scientific issues and to develop epistemic insight into the boundaries and relationships between disciplines.

Recent interdisciplinary studies, such as the Oxford Argumentation in Religion and Science (OARS) project, suggest that argumentation-based approaches can enhance students' understanding of both religious and scientific concepts by examining teacher practices and interdisciplinary scenarios (Erduran et al., 2019; Fancourt & Guilfoyle, 2022; Guilfoyle et al., 2021). Despite this work, a fundamental epistemological challenge remains. In science, knowledge and truth claims are mainly evaluated through empirical testing, logical consistency, and reproducible evidence (Ayer, 1936; Popper, 2005), whereas theological and worldview claims often draw on interpretive, revelatory, and experiential sources where what counts as data is far less standardised than in scientific inquiry (Billingsley et al., 2018). Hence, applying scientific argumentation scaffolds directly to RE fails to capture the distinct nature of religious discourse (Billingsley et al., 2018; Park et al., 2022). More critically, it risks epistemic reductionism, the methodological error of evaluating the truth claims of one domain exclusively through the validity standards of another. This is confirmed by empirical studies showing that students and teachers often face difficulties in

defining religious evidence, validating personal experience, and transferring argumentation skills from science to RE (Billingsley et al., 2018; Guilfoyle et al., 2021; Hacıeminoğlu & Yıldız, 2022).

These epistemic differences must be addressed if argumentation is to work meaningfully within RE. Incorporating argumentation into RE can help students to evaluate truth claims and clarify what counts as evidence in religious and worldview inquiry. It can also make explicit the warrants and backings that connect texts, traditions, and lived experience to normative conclusions. This makes the reasoning behind competing worldview claims more visible, structured, and open to critical inquiry without collapsing into relativism. However, despite growing interdisciplinary work in this area, existing adaptations of scientific argumentation models have yet to resolve how empirically grounded frameworks can accommodate RE's interpretive, normative, and faith-related ways of knowing (Billingsley et al., 2018; Erduran et al., 2019).

To address this gap, this paper proposes a theoretical framework for adapting Toulmin's argumentation model to RE in a way that respects the epistemic characteristics of religious discourse. The aim is to re-specify an effective structure from science education so that it can support critical engagement with religious and socio-scientific truth claims in epistemically appropriate ways. Although contemporary RE is a multi-disciplinary subject and may also employ historical and sociological methods of evidence-based reasoning, this paper focuses specifically on theological and philosophical reasoning, where truth claims about ultimate reality, meaning, and value present a distinct epistemic contrast.

In developing this framework, the paper draws on the critical religious education (CRE) approach (Wright, 2016) as a complementary theoretical framework. While CRE emerged in the British context in response to liberal and experiential approaches to RE, its roots in critical realism give it a normative framework with broader applicability. While there are other approaches to engaging with worldviews that reject strict positivism and treat religious traditions as subjects for critical and interpretive inquiry, such as Cooling's (2025) worldview approach, or Aldridge's (2018) hermeneutic approaches, CRE offers a particularly suitable framework for the present purpose. Toulmin's model provides a structural mechanism for students to construct and debate claims, while CRE offers the epistemological underpinnings of that structure, particularly through the principle of judgmental rationality. CRE requires students to move beyond surface-level descriptions toward reasoned evaluation of competing worldview claims about ultimate reality and our place in it (Wright & Wright, 2024). In this way, it helps make possible a richer and more epistemically appropriate argumentative discourse in contemporary RE. The study addresses three primary research questions:

1. How have epistemological differences between science and religion been characterised, especially regarding how knowledge is constructed and validated in each domain?
2. How do these epistemological differences shape argumentation practices in science education versus RE?
3. How can Toulmin's argumentation model be operationalised for classroom argumentation in RE through CRE to reflect RE's epistemic characteristics?

This paper addresses these research questions by developing a normative conceptual framework drawing on foundational texts from the philosophy of science, the philosophy of religion, and educational theory. By mapping CRE's core principles onto key

components of Toulmin's model, the paper aims to bridge a theoretical gap, developing a structured approach to argumentation in RE that is both rigorous and faithful to the nature of religious knowledge. Science education is used as a well-documented classroom instantiation of Toulmin and as a contrast case for clarifying how Toulmin's elements need to be interpreted for RE.

2 Epistemological Characteristics of Science and Religion

This section compares the epistemological foundations of science and religion in three parts: the epistemological criteria for science, the epistemological criteria for religion, and a comparative discussion of their methodologies. Outlining these helps clarify how knowledge is established in each domain and establish the foundation for understanding how argumentation differs in science and RE.

2.1 Epistemological Criteria for Science

2.1.1 Empirical Testability and Predictive Power

A core principle for scientific knowledge is empiricism, according to which claims should be grounded in observable evidence and sound logic, rather than authority or intuition. Historically, this principle was formalised through key criteria for testability. One important example is the logical positivist verification principle, which argues that a statement is scientifically meaningful only if it can be verified through experience and direct observation. However, as Godfrey-Smith (2003) argues, logical positivism and logical empiricism ultimately proved inadequate as general accounts of science, particularly because much scientific practice aims to describe hidden structures and unobservable phenomena, not merely observable patterns.

A second influential criterion is Popper's famous principle of falsification. According to Popper (2005), scientific theories cannot be definitively proven true; rather, what makes a theory scientific is that it generates predictions that could in principle be refuted by observation or experiment. Science thus progresses not by establishing certainty, but by subjecting theories to critical testing and eliminating those that fail. Falsifiability has often been perceived as a demarcation criterion between science and pseudoscience. However, it is not a decisive or exhaustive account of scientific method, since it has difficulty explaining probabilistic theories and does not provide a satisfactory account of rational theory choice across the sciences (Godfrey-Smith, 2003).

In experimental sciences, a practical criterion of scientific knowledge is reproducibility, the ability of independent researchers to replicate an experiment by using the original documentation and conditions and obtain comparable results. This criterion helps ensure that results are not coincidental, fabricated, or biased (Gundersen, 2021). As Woodward (2003) argues, scientists must show that repeating the same intervention on a variable X will systematically bring about the same change in Y and if no such reproducible relationship emerges, the corresponding causal claim should be questioned. Without independent repetition, one cannot distinguish a real empirical contradiction from experimental error. However, reproducibility and controlled intervention do not explain

scientific epistemology, because different scientific disciplines utilise different forms of empirical support.

This diversity is especially evident in the historical sciences. Cleland (2002) argues that historical sciences such as geology, archaeology, and astronomy use different patterns of evidential reasoning than those of experimental science, since past variables cannot be manipulated in controlled lab conditions. Consequently, historical researchers formulate competing hypotheses and search for traces that might function as "smoking guns", evidence that helps identify the best causal explanation among alternatives. This methodological difference highlights that empirical testability takes different forms across science (Cleland, 2002).

Scientific theories are also assessed by their explanatory and predictive power. Explanatory power refers to a theory's ability to account for known phenomena, whereas predictive power concerns its capacity to accurately predict novel or future phenomena. The preference for explanatory versus predictive power varies across scientific domains, and there may be trade-offs between them (Trafimow & Uhalt, 2015). For Popper (2005), theories with high predictive power are more likely to survive falsification because they yield more accurate and novel predictions. Van Fraassen (1980), by contrast, argues for empirical adequacy, maintaining that a successful theory must accurately describe observable phenomena, or "save the phenomena" (p. 12). He claims that a deep explanatory power or claims to literal truth are unnecessary because a theory's predictive success will suffice. These perspectives suggest that empirical testability is central in science, although the way it is understood and applied varies depending on questions, evidence, and methods of different scientific fields.

2.1.2 Methodology: The Spectrum of Closed and Open Systems

In many experimental sciences, methodology is usually associated with a closed-system ideal in which researchers establish reliable causal relationships by controlling and systematically isolating variables (Chalmers, 2013). This is mostly realised in experimental sciences like physics and chemistry, where researchers create highly controlled laboratory conditions so that, when one factor is manipulated and others are kept constant, any observed outcome can be explicitly attributed to the manipulated factor (Woodward, 2003).

This ideal, however, does not capture all scientific practice. Many fields, such as ecology, astronomy, and geology, investigate complex open systems where such strict isolation of variables is not possible. Bhaskar (2008) argues that the real world operates as an open system where multiple causal mechanisms interact and that constant patterns of events, characteristic of closed systems, are the rare, artificial exception rather than the rule. For Bhaskar, the value of science lies in this distinction, as he puts it, "as science occurs the world must be open" (p. 106). On this view, events in the real world are not simple cause-and-effect chains but conjunctures, that is, outcomes of many interacting forces. Open systems are thus not of lesser importance to scientific inquiry but central to much of the natural world that science seeks to understand (Bhaskar, 2008).

In such open systems, where direct experimental control is limited or impossible, scientists rely on other methods, including identifying patterns in complex datasets, building predictive models, and making inferences to the best explanation. Computer simulations

are especially important here. Yet, as Winsberg (2010) argues, simulation is not simply a matter of deduction. Because the equations in complex open systems are often analytically intractable, simulation depends on a "mixture of theory, approximation, physical intuition, and trial and error" (p. 93). This introduces an element of normativity into scientific methodology, for scientists must decide which variables and approximations are acceptable to ensure a model adequate for a particular purpose. Such methods do not weaken scientific reliability; rather, they highlight the importance of the integration of theory, computational limits, and evaluative judgment in scientific inquiry.

2.1.3 Objectivity, Interpretation, and Paradigms

Scientific objectivity seeks to produce reliable accounts of an external world through theories, laws, and findings. Scientific explanations usually refer to causal structures, processes, relations, and mechanisms that are treated as ontologically real and independent of human projections. This ideal of objectivity matters because an objective test is assumed to be "a more reliable test than is one administered by the testee", for it reduces the risk of systematic error (Kosso, 1989, p. 257).

At the same time, objectivity is pursued within historically situated practices of observation, measurement, modelling, and interpretation. As Bhaskar (2008) argues, scientific knowledge is a "social product much like any other" (p. 11), produced by people within specific historical and institutional settings. Yet, rather than accessing an objective reality merely through subjective human experience, contemporary philosophers emphasise the role of materiality. Hanna (2004) argues that "the empirical base of advancing contemporary science does not consist of anyone's sense data or perceptions" but relies upon complex technological artefacts (p. 342). Scientific representation is inherently perspectival, and scientific models are best understood as productive inferential blueprints that "allow different epistemic communities to come together and make the relevant and appropriate inferences about the target system" (Massimi, 2022, p. 14).

This material basis necessitates a hermeneutic or interpretive dimension to bridge the gap between raw data and scientific facts. As Massimi (2022) highlights, raw data are never self-explanatory; researchers must actively use interpretive "data-to-phenomena inferences" (p. 215) to turn material productions into scientifically meaningful phenomena. Researchers must decide what counts as evidence rather than artefact, specify how theoretical concepts are operationalised, decide which variables to control, and select models that represent the target patterns appropriately. This does not reduce science to textual interpretation, but it suggests that scientific understanding requires structured interpretive judgment to connect material evidence to conceptual models. Following Gadamer's (2008) view that understanding is always situated, theory-laden observation and interpretive modelling are unavoidable features of any kind of inquiry.

Kuhn's (1996) notion of paradigm helps elucidate how this interpretive dimension operates collectively. Scientific communities work within shared patterns of beliefs, values, methods, and exemplars that shape which problems matter and how evidence is interpreted. In this sense, scientific inquiry is never free from conceptual frameworks, although this does not suggest that science collapses into subjectivism. Scientific interpretation is constrained by both material and interdisciplinary scrutiny, and the risk of collective bias within any single paradigm is controlled via cross-perspectival assessment across different scientific disciplines (Massimi, 2022). Together with reproducibility, predictive success, open criticism, and peer review, these material and interdisciplinary checks function as self-correcting mechanisms for managing bias and testing adequacy (Hanna, 2004; Massimi, 2022; Reiss & Sprenger, 2020; Van Fraassen, 1980). Through these collective practices, scientists aim to achieve a reliable

form of objectivity that reduces the epistemic risks arising from our cognitive and social imperfections (Koskinen, 2020).

2.2 Epistemological Criteria for Religion

2.2.1 Revelation, Authority, and Warrant

In contrast to scientific inquiry, which emphasises empirical testability and predictive power, religious knowledge follows a distinct set of epistemological criteria for constructing meaning and validating truth claims about ultimate reality or the transcendent. Building on a critical-realist view, McGrath (2019) maintains that in theology, reality is stratified and differentiated, and that "religion is a multi-layered phenomenon which cannot be reduced to any of its communal, symbolic, narrative, or ideational elements" (pp. 72–73). Hence, within this theological framework, a religious truth claim, such as "God is all-merciful" is not understood merely as a moral or emotional sentiment, but as an acknowledged ontological description of an independent divine reality.

In a religious epistemology, revelation from a transcendent authority, such as God or the ultimate reality, serves as a primary source of truth for adherents. In contrast to science, where authority is mainly established through empirical verification, religious knowledge is fundamentally textual and communal, interpreted and preserved within ongoing traditions. While core religious claims may not be empirically verifiable in a direct, experimental sense, these sources carry strong evidential influence for the adherents of faith traditions. Reliance on divine authority and revelation does not preclude rationality. As Stenmark (1995) and McGrath (2002) argue, while the fundamental demand of rationality is universal, the methods for evaluating truth claims and the means available to practitioners must be appropriate to the specific practice and subject matter. Rationality is thus context-dependent; that is, within a faith context, revealed truths may function as foundational axioms or primary evidence, much as empirical facts do within scientific reasoning.

Philosophers have proposed various mechanisms for how such beliefs may be rationally warranted within their respective systems. Alston (1982) develops this through the concept of epistemic practice, arguing that a belief is validated within the system to which it belongs. Alternatively, Plantinga (2000), drawing on his Aquinas/Calvin model,[1]argues that belief in God is "properly basic with respect to warrant" (p. 149). On this view, belief may appear through the *sensus divinitatis* (or by the internal instigation of the Holy Spirit), conceptualised here as a cognitive faculty that, when functioning properly in an appropriate epistemic environment, can confer warrant sufficient for knowledge without requiring empirical testing.

2.2.2 Existential Adequacy and Transformative Power

A further key criterion for religious knowledge is its existential adequacy, the capacity to address basic human experience and existential questions. Religious beliefs aim to provide

[1] Plantinga combines Aquinas's theory of "a natural knowledge of God" with Calvin's ideas of *sensus divinitatis* and the "internal testimony of the Holy Spirit". In his A/C model (Aquinas/Calvin model), (1) the *sensus divinitatis* can generate properly basic theistic belief in ordinary experience, and (2) the Holy Spirit, working especially through scripture, elicits and confirms specifically Christian faith (Plantinga, 2000).

existentially intelligible answers to the profound realities of life such as death, the meaning of life, suffering, and love (Stenmark, 1995). Tillich (1957) addresses this as "the state of being ultimately concerned" (p. 1). As McGrath (2010) notes, "science tends to ask 'how' questions, where religion asks 'why.' Science seeks to clarify mechanisms; religions offer meaning" (p. 3); that is, religion is primarily concerned with questions of purpose and value rather than empirical predictions. Religious beliefs are often evaluated by their ability to shape personal experience and provide ethical direction. As such, the rationality of religious belief is judged by considering "how it does things, overcomes guilt and alienation, creates forgiveness and meaning, and so on" (Stenmark, 1995, p. 268).

Closely related to existential adequacy is the normative and transformative power of religious knowledge, that is, its capacity to produce moral outcomes and encourage spiritual transformation. The transformative aspect can be observed in the profound changes individuals may experience through religious rituals and practices, often accompanied by a sense of connection to ultimate reality. Hick (1989) argues that religious traditions are assessed through their "soteriological efficacy": their power to transform "human existence from self-centredness to Reality-centredness" (p. 14). The normative aspect, meanwhile, refers to a religion's role in providing a coherent moral framework, such as the Five Precepts or the Ten Commandments, that guides and transforms the lives of adherents. As Smart's (1998) multi-dimensional analysis of religion highlights, these ethical and experiential dimensions are central to the way believers internalise truth and connect it with lived practice. Religious knowledge is both descriptive and prescriptive, offering transformative guidance on life, and is ultimately justified by its moral and spiritual outcomes, such as wisdom, virtue, and inner transformation.

2.2.3 Methodology: Open Systems and Hermeneutics

The methodology of religious inquiry is shaped by the nature of the reality it investigates. Religious inquiry operates within open systems (Bhaskar, 2008), dealing with complex human experience, historical traditions, and transcendent claims where many interacting factors make prediction and strict reproducibility difficult. It often begins from basic human experience and existential questions, aiming to provide existentially intelligible answers to realities such as suffering and meaning (Stenmark, 1995). Closed-system methodologies of experimental science are often inapplicable, as variables cannot be isolated, and the phenomena in question are deeply interconnected and emergent.

A common principle for assessing beliefs is faithfulness to authoritative sources. As McGrath (2002) asserts, theology responds to an objective reality, God, through revealed truths and lived experience. Within a faith context, this can still be rationally assessed through criteria such as coherence, factual adequacy, and compatibility with well-established facts (Van Holten, 2002). Reliance on authority does not necessarily entail uncritical acceptance, since many faith traditions incorporate internal methods of critique, including scholastic reasoning or jurisprudence. Thus, theology aims to explain reality, but it does so through interpretive engagement with revelation, tradition, and communal experience rather than through empirical verification (McGrath, 2002).

Religious epistemology employs distinct methods that prioritise coherence, existential depth, and transformative power. For instance, abductive reasoning (inference to the best explanation) is used when moral order, cosmological order, or experiences of personal transformation are thought to be best explained by divine reality. This allows theology to operate with the same explanatory norms as the natural sciences while maintaining

its interpretive nature (McGrath, 2010). The use of symbolic language and metaphor is another common method. Tillich (1957) argues that religious symbols participate in the reality to which they point, making that reality accessible in ways that would otherwise remain beyond human reach. Hence, a symbol's truth is justified by the depth and adequacy of meaning it discloses rather than by empirical prediction.

Hermeneutics is another methodological tool used in the interpretive frameworks of religions, though its application and epistemic authority are significantly contested. The interpretation of scriptural texts, rituals, symbols, and experiences within a living faith community aims to create a fusion of horizons between the sacred and the believer (Gadamer, 2004). An interpreter's historical and cultural context, as well as their pre-interpretive framework, has a deep influence on their current understanding of a text or phenomenon.

Although some scholars describe hermeneutics as "an important antidote to fundamentalism and rehabilitates religious and literary truth" (Zimmermann, 2016, p. 104), introducing it as a normative corrective tool understates deep internal disagreements within faith traditions. Hermeneutics itself is a primary source of epistemic conflict, as orthodox, literalist, and progressive groups continuously dispute the validity of interpretive methods. This raises a critical question of how to avoid interpretive arbitrariness and relativism. Since religious claims generally lack direct empirical falsifiability, interpretation is often constrained by internal communal norms. In Christian theology, such constraints include ecumenical creeds, established scholarly norms, the textual limits of scripture itself, and catholic councils (Westphal, 2009). Similarly, Hallaq (2004) demonstrates that subjective interpretation in Islamic law is constrained by established legal doctrine, a strict hierarchy of sources, analogical reasoning/*qiyas*, systematic weighing of evidence (*tarjih*), and consensus (*ijma*). These traditional mechanisms help define the boundaries of valid interpretation within a given tradition.

In religious hermeneutics, texts are considered authoritative not because of their predictive nature, but because they are understood as disclosing divine reality within a faith community (Gadamer, 2004). For instance, in Christian theology, biblical exegesis is embedded within the church's sense of identity and worship, and these ecclesial settings determine how scripture discloses divine truth and guard against unorthodox interpretations (Bultmann, 2019). In sum, science and religion may share an interpretive logic but they diverge in their norms of validity and their mechanisms for constraining arbitrariness.

2.3 Epistemological Synthesis: Post-foundationalism and Transversal Dialogue

Science and religion differ methodologically, but they are not necessarily incompatible. Contemporary philosophy offers ways of bridging this divide without collapsing their distinctiveness. Van Huyssteen's post-foundationalism argues that both science and theology must recognise the historical and cultural situatedness of all understanding (Van Huyssteen, 1996, 2001). He offers a "third way", beyond foundationalism, that is, absolute certainty and relativism, recognising that human "rationality emerges as a deeply social and historical practice, always embedded in the experiences and narratives of our daily lives, and contextualised by the radical interpretative nature of all our experiences" (Van Huyssteen, 2001, p. 68).

Within this framework, Van Huyssteen proposes a transversal rationality. Although justifications are specific to their respective domains, rational engagement and critical evaluation across domains are possible via ongoing interpretive dialogue. He claims that both

science and theology must involve the "three contexts of rationality": cognitive rationality in forming warranted beliefs, evaluative rationality in making sound value judgments, and pragmatic rationality in acting responsibly (Van Huyssteen, 1996, p. 113). In practice, this means that religious beliefs can be discussed and assessed with reasons, even when those reasons are not identical to scientific evidence.

Van Huyssteen's transversal rationality also fits broader contemporary discussions of interdisciplinary rationality. McGrath (2019) advances a model of multiple situated rationalities that allows interdisciplinary and transdisciplinary dialogue across varied disciplines. On this view, science and theology retain distinct forms of inquiry but may still interact through cross-disciplinary engagement. This aligns with integrative pluralism (Mitchell, 2002) in philosophy of science, which holds that the complexity of nature requires constructive interaction of multiple disciplinary perspectives rather than reducing them to a single level. In the same vein, O'Rourke et al. (2016) argue, "integration in the cross-disciplinary context involves bringing inputs — whether they be cognitive, communicative, or social — into an integrative relation, i.e., into a combination that supports interpretation of them as a single, coherent whole" (p. 68). Transversal rationality thus can be seen as part of this wider pluralist approach to explain the constructive interaction between science and theology while maintaining their differences.

Despite their significant differences in evidence, truth, and methods, science and religion still share basic epistemic virtues, including logical coherence, critical inquiry, and experiential adequacy. This common ground makes a dialogical or transversal engagement possible (Van Huyssteen, 2001). Recognising the shared and divergent elements of both domains is important for avoiding categorical mistakes, such as committing the "epistemic fallacy", the error of reducing reality to our knowledge about it (Bhaskar, 2008).

A dialogical, post-foundational approach allows for mutual enrichment while preserving disciplinary distinctions. This creates the conditions for the kind of domain-specific argumentation framework developed in this paper. In this sense, CRE can be understood as a broader post-foundational approach seeking to hold together contextuality, rational evaluation, and ontological reality without collapsing into either foundationalism or relativism. A summary of these comparative epistemic criteria is presented in Table 1.

3 Use of Argumentation Theory in Science Education

Argumentation in science education is deeply linked to how scientific knowledge is constructed and justified. As Duschl and Osborne (2002) argue, science education should focus not only on "what we know, but also on how we know and why we believe it" (p. 40). This requires understanding how scientific evidence is used to build explanations and the selection criteria. Argumentation is a central classroom practice for achieving these goals (Duschl & Osborne, 2002). As Jiménez-Aleixandre and Erduran (2007) note, the use of argumentation in science education makes cognitive and metacognitive processes accessible, while also developing students' communicative skills, critical thinking, scientific literacy, and scientific reasoning. It also supports "the enculturation into the scientific culture and developing epistemic criteria" (p. 5).

Recent literature suggests that research on scientific argumentation now extends beyond demonstrating classroom benefits toward broader concerns such as assessment, classroom culture, teacher preparation, and differing theoretical approaches (Henderson et al., 2018). It also argues that argumentation-based instruction can support learning across cognitive,

Table 1 Comparison of epistemic criteria in science and religion

	Science	Religion
Primary sources of knowledge	Observable evidence, experimentation, and logical inference	Revelation and authority (sacred texts, established traditions), foundational religious experience, and philosophical reasoning
Typical validation norms	Empirical testing, falsification, and reproducibility	Internal coherence, faithfulness, justified belief, hermeneutic interpretation
Common evaluative standards	Explanatory, predictive power, and empirical adequacy	Existential adequacy, moral fruitfulness and transformative power
Stance toward knowledge	Aims for empirical objectivity (though guided by paradigms)	Often requires personal/communal commitment and epistemic humility
Typical system dynamics	Prioritises closed systems (separating variables); models open systems	Engages with open systems of complex human experience

ontological, and intentional dimensions, especially when combined with scaffoldings such as collaboration, feedback, and contextual support (Li et al., 2022). Within this literature, Toulmin's model remains influential because it offers a practical framework for analysing how scientific claims are supported, justified, and challenged in classroom discourse. Toulmin's argumentation model has also been shown to support high-quality argumentation and critical thinking skills in science classrooms (Giri & Paily, 2020; Osborne et al., 2004).

In his influential work *The Uses of Argument*, Toulmin (2003) distinguished between formal logic and the way arguments are used in natural settings. He developed a model to analyse the structure and quality of arguments that has since become highly influential in science education. Crucially, Toulmin did not intend to create an inherently scientific framework; rather, he offered a broadly applicable schema for practical reasoning across any open, interpretive domain such as law, history, ethics, and science. He argued that while the force—the structural layout of an argument—remains constant across disciplines, the criteria—that is, what counts as valid evidence or justification—are strictly field-dependent.

This study uses Toulmin's argumentation model to analyse how its components operate in science education and what discipline-specific epistemic norms they express. In science education, components of Toulmin's model function as more than rhetorical methods; they are classroom enactments of science's epistemic criteria, such as empiricism, objectivity, falsifiability, and reproducibility.

The model structures an argument into six core components. Data refers to "the facts we appeal to as a foundation for the claim" (Toulmin, 2003, p. 90). What counts as valid data is field-dependent. In science education, the Toulmin model is often used to help students work with evidence that is verifiable, accessible, and open to scrutiny when constructing scientific arguments.

A claim, in Toulmin's terms, is "the conclusion whose merits we are seeking to establish" (2003, p. 90). In science, a claim is not treated as final or unquestionable; rather, it is provisional and subject to continuous revision in the light of new evidence or more compelling arguments, reflecting the principle of tentative fallibilism (Popper, 2005). A claim's acceptability depends on its predictive and explanatory adequacy and on critical scrutiny within the scientific community, including peer review (Popper, 2005; Van Fraassen, 1980).

According to Toulmin (2003), warrants are "hypothetical statements, which can act as bridges, and authorise the sort of step" taken from data to a claim (p. 91). In science, the warrant often takes the form of general rules, natural laws, or scientific principles that justify the move from empirical data to a claim. This inferential link is expected to show explanatory and causal power, falsifiability, and methodological reliability.

To hold genuine authority, however, the scientific warrant must rely on a solid backing. As Toulmin (2003) emphasises, while warrants are hypothetical bridges, backing consists of the categorical, foundational "assurances, without which the warrants themselves would possess neither authority nor currency" (p. 96). In science education, backing usually comes from established theories, accepted empirical laws, or wider disciplinary knowledge. In this way, the argument is grounded in the empirical foundations of the discipline.

Because practical arguments do not always establish conclusions with absolute certainty, Toulmin (2003) also includes qualifiers and rebuttals in his model. Qualifiers indicate the strength of the claim by using terms such as "presumably", "necessarily", or "probably". On the other hand, arguments must anticipate exceptional circumstances, conditions of rebuttal, where this strength is limited. Structurally, the rebuttal identifies the "circumstances in which the general authority of the warrant would have to be set aside"

(p. 94). In science education, rebuttal is especially important because it reflects openness to falsification and the principle of tentative fallibilism. Erduran et al. (2004) argue that arguments with rebuttals are stronger because they require genuine engagement with opposing claims and encourage students to test the limits of their reasoning within specific epistemic norms.

This science-specific argumentation structure is illustrated in Sóñora et al.'s (2025) study of students' arguments regarding soil formation. Students grounded their provisional claim that soil formation takes between 100 and 15,000 years in shared, observable data, noting that "there are many stones… and in some areas the topsoil isn't very deep". They then linked these observations to geological reasoning about erosion, drawing on established knowledge of sedimentation and physical causation. Their claim was further tested through peer challenge, as one student explicitly questioned the causal inference by saying, "I don't know if that's right" (Sóñora et al., 2025, p. 232). The example shows how empirical observation, causal explanation, and peer critique are coordinated in a scientific argumentation.

In science education, Toulmin's model is shaped by the epistemic norms of science. Scientific arguments are presented as claims open to scrutiny through shared evidence, explicit reasoning, and critical challenge rather than as absolute judgments about truth. This clarifies how argumentation works in science subject and points to the need for a context-specific adaptation for RE.

4 The Case for Argumentation in RE

Argumentation is seen as a valuable practice in RE because it supports critical thinking, civic literacy, and a deeper understanding of religion as a discipline. Following Toulmin's (2003) view that the standards for assessing warrants and backing are field-dependent, argumentation is particularly useful in RE for reaching rational and well-grounded judgments about beliefs and values. According to Siegel (2023), "an argument is good, epistemically, to the extent its premises/reasons warrant belief in its conclusion/standpoint, that is, to the extent it renders belief rational" (p. 472). This is consistent with Toulmin's account of a warrant as the inferential rule that authorises the move from data to claim and which can be challenged and supported by rebuttals and backing (Toulmin, 2003). Hence, a structured approach to argumentation provides a powerful basis for developing students' rationality, grounded in pedagogical, civic, and epistemic goals.

4.1 Pedagogical, Civic, and Epistemic Rationales

The case for argumentation in RE relies on pedagogical, civic, and epistemic rationales. Pedagogically, argumentation is an essential tool for developing deeper conceptual understanding and strengthening critical thinking (Erduran et al., 2017; Jiménez-Aleixandre & Puig, 2012). From a constructivist view of learning, meaningful conceptual change is "dependent on the opportunity to socially construct, and reconstruct, one's own personal knowledge through a process of dialogic argument" (Driver et al., 2000, p. 298). Studies also suggest that dialogic, peer-based approaches can significantly improve students' ability to use evidence and produce more sophisticated arguments (Kuhn & Crowell, 2011). In addition, argumentation supports the development of critical thinking dispositions,

including evaluating claims with evidence, questioning authority, and forming independent views (Jiménez-Aleixandre & Puig, 2012).

From a civic perspective, argumentation builds democratic capacity needed in pluralistic societies. It develops significant interpersonal skills such as empathy and critical detachment (Walton, 1989). Fancourt and Guilfoyle (2022) describe this in terms of "perspective-taking", the ability to understand someone else's reasoning by following their line of thought. This empathetic and analytical engagement is necessary if students are to address complex social issues as informed global citizens.

On an epistemic level, argumentation can develop students' insight into the nature of knowledge across different disciplines (Billingsley et al., 2018). In particular, structured argumentation can challenge uncritical scientism, the assumption that empirical science is the only valid way of knowing. Such assumptions may lead students to perceive a necessary conflict between science and religion, treating science as objective and true while dismissing religion as illusory and irrational (Billingsley et al., 2021; Cooling, 1990). Making explicit the reasons and justifications behind worldview claims helps students realise that both domains are living traditions involving continuous interpretation, critique and internal debate. This prevents them from viewing science as a monolith of facts or religion as unquestionable dogma (Osborne, 2010). Empirical studies also indicate that while students tend to use rationalistic and descriptive reasoning in science, they often default to more normative and intuitive forms of reasoning in religion (Basel et al., 2014; Sadler & Zeidler, 2005). Given this inclination, RE particularly benefits from structured argumentation frameworks that can help students refine their intuitive responses into more rigorous ethical and religious inquiry.

4.2 Pedagogical and Epistemic Challenges

Applying argumentation in educational contexts involves significant challenges, which can be understood as general pedagogical barriers and RE-specific epistemic difficulties. In terms of pedagogical challenges, educators face obstacles across subjects, including creating dialogic spaces, shifting students' epistemic perceptions of science, overcoming limited teacher experience with a culture of critique, and dealing with the inherent difficulty of assessment. A further issue is that argumentation skills are not innate; rather, they must be taught explicitly if they are to develop (Kuhn & Crowell, 2011). Educational environments can also present structural barriers, such as rigid subject compartmentalisation, which makes it difficult for students to connect different ways of knowing across disciplines (Billingsley et al., 2018).

In RE specifically, these general challenges are intensified by the subject's distinctive epistemological nature, appearing in student attitudes, epistemic ambiguity, and curricular limitations. Regarding student attitudes, pupils often exhibit biases as they build a "wall of resistance" (Cooling, 1990) and dismiss religious claims on scientific grounds (Billingsley et al., 2018). Discussions may also turn to a competitive "battle for victory" rather than a reasoned inquiry (Hacıeminoğlu & Yıldız, 2022). Such attitudes hinder perspective-taking and instead lead students to treat the opposing view as mistaken, weak, or dismissible (Fancourt & Guilfoyle, 2022).

While the case for argumentation in RE is strong, empirical studies emphasise a key problem. Students' argumentation skills are consistently stronger in science, whereas they usually struggle to construct high-quality arguments on religious and ethical matters,

especially when forming well-justified warrants (Basel et al., 2014; Guilfoyle et al., 2023). This problem stems from the epistemic complexity of RE, which, unlike science, often lacks "clear standards about what counts as evidence for an argument in the subject, or how different evidence is warranted" (Guilfoyle et al., 2023, p. 772). Since theology and philosophy employ field-dependent criteria that are rarely made explicit, students face a significant epistemic barrier to success.

This epistemic ambiguity is further exacerbated by issues at the curricular and teaching levels. An analysis of RE syllabi in England found that while argumentation is encouraged, the syllabi fail to explicitly define the criteria for evidence, warrant, and backing (Chan et al., 2020). This curricular ambiguity, in turn, leads to varied classroom practices. Studies suggest that science teachers tend to use argumentation to justify a correct claim, while RE teachers use it as a tool for exploring multiple valid perspectives, especially regarding controversial issues where no single evaluative standard exists (Park et al., 2022). These challenges highlight the need for a coherent epistemic framework for argumentation in RE, one that can respond to the subject's distinct epistemic nature while also addressing students' specific learning needs.

4.3 Critical Religious Education

The CRE approach offers a philosophically grounded and practical framework for structuring argumentation in RE and addressing the pedagogical challenges identified earlier. In this paper, CRE is adopted as an analytical and methodological choice rather than an exclusive claim. CRE functions as a heuristic tool (Cooling, 2025; Wright & Wright, 2024) within a broader post-foundational setting, offering a rich structured approach for equipping students to critically evaluate competing worldview claims in multi-faith and multicultural societies. While originally developed by Andrew Wright, it has also been taken up and operationalised in a growing body of scholarship, including developing classroom-based schemes (Goodman, 2018), practical materials for classroom implementation (Easton et al., 2019) and empirical works that address specific faith-based contexts (Demirel Ucan & Wright, 2019). Moreover, the framework's broad adaptability is highlighted by its relevance to the contemporary religion and worldviews approach in England. Cooling (2025) argues that knowledge in RE should enable pupils to make "mature, informed, reflective, scholarly and reasoned judgements" when encountering diverse religious and non-religious worldviews in the RE classroom (p. 134).

Grounded in critical realism, CRE views RE as an intellectual pursuit of truth aimed at both human and collective flourishing. It is built on three core principles of classical critical realism: ontological realism, a commitment to the objective reality of truth claims; epistemic relativism, the acknowledgment that human knowledge is provisional and interpretive; and judgmental rationality, the systematic, reasoned evaluation of competing truth claims. This approach encourages students to critically engage with fundamental existential questions across diverse perspectives and treat religious assertions as claims open to debate (Wright, 2016).

CRE acknowledges that ultimate truth, while ontologically real, is accessed through interpretations "always mediated by cultural beliefs and practices" (Wright, 2016, p. 207). Consequently, it acknowledges epistemic relativity without dismissing the possibility of rational assessment. Similarly, Stones and Fraser-Pearce (2021) argue that recognising the social construction of knowledge reflects epistemic relativity. It acknowledges that while truth objectively exists (ontological realism), "all we have access to is our

construction of it" (Stones & Fraser-Pearce, 2021, p. 357). On this view, the task of RE is not simply to map plurality of perspectives but to develop pupils' capacity to engage responsibly with different forms of knowledge and justifications.

This is where epistemic literacy becomes educationally central. Stones and Fraser-Pearce (2022) define epistemic literacy as "the competency and proficiency in the identification, interpretation, understanding, questioning, navigation and communication of knowledge" (p. 374). This makes epistemic literacy a solid foundation for a critical realist pedagogy. Without the ability to differentiate between verified knowledge, theological faith, and uninformed opinion, students might risk suffering from epistemic injustice. Also, in attempting to be overly respectful, students might treat all opinions and beliefs as uncritically equal, preventing any real pursuit of truth (Fraser-Pearce & Stones, 2023).

Wright (2016) distinguishes the principle of judgmental rationality from a positivist understanding of critical thinking, which aims for absolute certainty, or epistemic closure. Judgmental rationality involves ongoing, disciplined, and reasoned assessment of competing truth claims while acknowledging the limits of human knowledge. The primary goal is not to foster abstract critical thinking skills but to instil epistemic virtues like epistemic humility, attentiveness, reasonableness, and responsibility. Easton (2024) emphasises that the process of epistemic humility is a necessary disposition for the pursuit of truth, as it encourages students to interpret religious claims on their own terms, acknowledge the limits of one's knowledge, consider multiple perspectives, and remain open to uncertainty rather than seeking to simply prove or disprove a belief. With the complementary dispositions of epistemic literacy and epistemic humility, the pedagogical task "is not that reality must be accommodated within the cognitive structures of the mind, but that the cognitive structures of the mind must be accommodated to reality" (Wright, 2016, p. 233). This also aligns with Walton's (1989) view that true critical thinking is not merely about spotting informal fallacies, but about engaging in a fair and justified argumentation process based on the rules of a specific discourse.

This process of judgmental rationality is inherently comparative, evaluating worldviews based on their relative explanatory power. This judgment is not achieved by applying abstract and external criteria to competing claims, which Wright argues would commit the "epistemic fallacy" (Wright, 2016). Instead, it relies on the "illative sense", a form of practical reasoning that weighs cumulative probabilities and competing narratives in real situations (Wright, 2016). The illative sense provides the epistemic warrant for moral, aesthetic, and religious commitments, by subjecting them to rational assessment rather than treating them as purely subjective. Explanatory power is evaluated through attentive and responsible engagement, a process embodying "faith seeking understanding" rather than a formal checklist. In religious and worldview inquiry, this involves asking how well a claim makes sense of reality and human experience. To guide the illative sense in the classroom, the present framework highlights four indicators of explanatory power: internal coherence, scope, existential adequacy, and moral fruitfulness.

The application of these criteria varies by context. In a multifaith classroom, they are mainly used to compare worldviews and consider how different traditions explain reality and support their claims. This can deepen students' epistemic insight into how traditions employ evidence and reasoning. In a faith-based classroom, the focus often shifts to intra-worldview interpretation, where foundational authority, such as sacred scripture, is often self-evident. In such settings, the criteria are used not to challenge those foundations from outside, but to support careful interpretation and theological reasoning within the tradition. For instance, Demirel Ucan (2020) shows how Islamic RE can hold fast to the Qur'an

and Sunnah as authoritative while still engaging diverse historical, sectarian, and cultural understandings of scripture, including in relation to contemporary challenges such as secularism and radicalisation. In both contexts, developing the illative sense allows students to make reasoned judgments without falling into either absolute relativism or dogmatic closure, while maintaining epistemic humility.

The multi-disciplinary character of RE must also be recognised. In classroom practice, RE often exhibits a hybrid character, with students moving between historical, social-scientific, philosophical, ethical, and theological types of inquiry. A failure to distinguish between these types risks epistemic confusion, where the norms of one type are improperly applied to other types of claims. Therefore, the framework must ensure that the warrant matches the type of inquiry being applied. As summarised in Table 2, while the structural elements of Toulmin's model remain constant, the epistemic requirements for data, warrant, and backing may reasonably shift across RE tasks. The framework proposed in this paper mainly focuses on theological and worldview reasoning, using judgmental rationality to help students analyse claims about ultimate reality, meaning, and value, where solely empirical warrants do not apply.

4.4 CRE-Adapted Model for Argumentation

To implement argumentation in RE, guided by the principles of the CRE approach, Toulmin's model requires a contextually grounded adaptation. While science education has successfully demonstrated the pedagogical value of structured argumentation, this paper has established that the epistemic criteria of science cannot simply be assigned to RE. What is required is a pedagogical translation, that is, adopting the structured rigour of argumentation found in science classrooms, while entirely re-specifying Toulmin's elements to align with RE's distinct epistemic demands. As Park et al. (2022) demonstrated, teachers are already familiar with using scaffolds like P-E-E (point-evidence-explanation) or C-E-R (claims-evidence-reasoning); therefore, the proposed CRE-adapted argumentation model can be seen as a more structured and epistemically aware version of these existing approaches.

The CRE-adapted argumentation framework is specifically designed to help students engage with claims about ultimate reality, meaning and value that arise from diverse and competing epistemologies. Grounded in critical realism, the framework balances epistemic relativity with judgmental rationality. Judgmental rationality ensures that the argumentation process is directed toward the genuine pursuit of truth. Instead of building mere consensus or mapping descriptions, it encourages students to develop a deeper and more complex understanding through responsible engagement with reality (Wright, 2016). While general argumentation fosters critical skills, judgmental rationality guides those skills toward a genuine and empathetic critical engagement with diverse religious and secular viewpoints, moving beyond simple persuasion to a disciplined evaluation of competing claims.

4.4.1 Adapting Toulmin's Components for RE

In a CRE-adapted framework, data represents the culturally mediated sources that inform students' initial and later claims: "Knowledge of the ultimate order-of-things is always mediated by cultural beliefs and practices" (Wright, 2016, p. 207). Data in RE is not limited to empirical facts but includes a variety of sources, which include scriptural

Table 2 Field-dependent epistemic requirements for Toulmin's components across types of inquiry in RE

Claim type	Data	Warrant	Backing
Historical	Primary/secondary historical sources (documents, artefacts, textual records), historiographical surveys (Monte-Sano & Allen, 2019)	Historiography (source reliability, corroboration, contextual inference) (Wineburg, 1991), Substantiation, perspective recognition (Monte-Sano & Allen, 2019)	Historical method/disciplinary heuristics (Van Drie & Van Boxtel, 2008); historical thinking, ethical dimensions, second-order concepts (Reisman et al., 2019)
Social-scientific	Specific scientific facts/empirical data (direct observations, interviews, surveys), Contextual/Interdisciplinary information (policy, biology, economy) (Basel et al., 2014; Sadler, 2011; Sampson et al., 2011)	Informal/consequential reasoning (weighing alternatives, pros/cons, trade-offs) (Zohar & Nemet, 2002); Normative/empirical reasoning (social, economic, moral, and empirical values) (Basel et al., 2014), evaluating adequacy and bias (Kolstø et al., 2006; Zeidler et al., 2011)	Constitutive/contextual values (Kolstø et al., 2006); Personal identities and belief systems (Sampson et al., 2011; Zeidler et al., 2011); Broader moral/value systems (e.g. ethics, bioethics) (Zohar & Nemet, 2002)
Philosophical	Propositions, conceptual definitions, thought experiments, intuitions, (Dutilh Novaes, 2022; Frogel, 2004)	Logical validity, deductive inference, soundness (Kock, 2023); coherence, sceptical refutation and counterexamples (Brutian & Wilson, 1979; Dutilh Novaes, 2022)	Formal logic, universal validity, methods of clarification, consensus (Frogel, 2004; Kock, 2023)
Ethical	Accepted moral opinions, facts, community standards (Walton, 2003)	Normative justification (Rights and duties, virtue ethics, values, consequences, rule of law, authority, experience) (Berne, 2014; Greene, 2025)	Ethical frameworks, community values, worldview traditions (Walton, 2003)
Theological/worldview	Scriptural texts, tradition, religious experience, doctrinal reasoning	Coherence, scope, existential adequacy, moral fruitfulness (McGrath, 2010, 2019)	Worldview traditions & Critical realism

or philosophical foundational texts, established traditions, historical accounts, reasoned arguments, communal narratives, individual and shared human experience. Developing the epistemic literacy to identify and critically engage with these distinct forms of data is essential for students to evaluate the strength of an argument within its appropriate context (Stones & Fraser-Pearce, 2022).

An important aspect of argumentation in RE is recognising that different traditions assign different weights or hierarchies of authority to these sources such as prioritising scripture over reason, or vice versa. For instance, empirical work in an Islamic context illustrates how pupils can treat Qur'an and Sunnah as authoritative while still engaging diverse interpretive traditions and intra-religious plurality (Demirel Ucan, 2020). Furthermore, while personal experience can be used as powerful data, it does not stand as self-validating proof. The CRE approach requires students to think how that experience is interpreted and warranted within communal narratives and interpretive frameworks of a worldview.

In a CRE-adapted framework, a claim is a reasoned conclusion about an ethical, theological, aesthetic, or existential issue that has an explanatory power for the ultimate meaning and purpose of our lives. Claims in CRE are categorised by their ontological nature, and they are understood as assertions about ontological reality rather than mere subjective opinions (Wright, 2016). As Easton (2019) proves empirically, without this explicit ontological scaffolding, students easily commit a category error, by reducing religious claims to mere subjective preferences to avoid critical engagement. However, recognising epistemic relativity, these claims are held with humility, understood as provisional, tradition-mediated, and contestable. For example, statements like "Human life should not be fundamentally re-engineered" or "The purpose of medicine is to alleviate suffering" are examples of a claim in the CRE context.

Warrant is the practical application of judgmental rationality in a CRE-adapted framework. It is the inferential rule used to justify the use of a particular piece of evidence, such as a scriptural text, as a valid reason to believe a particular claim about the ultimate reality. As Wright (2016) argues, "Judgements between conflicting worldviews cannot be judgments made against independent epistemic criteria; rather, they involve the comparison of conflicting worldviews in an attempt to discern which of them enjoys greater explanatory power" (p. 238). The strength of a warrant is evaluated by how effectively it utilises indicators such as coherence, scope, existential adequacy, and moral fruitfulness, discerned through the illative sense, to connect the data to the claim. For example, a warrant could be a hermeneutical rule that interprets a text as a moral command or a theological concept that humans are created as God's stewards on Earth, which entrusts them with a sacred responsibility for creation.

Backing is the principle that supports the warrant, providing the deeper theoretical or foundational justification for it. In a CRE-adapted framework, backing can be systematic theology, established philosophical systems such as Humanism and Kantian ethics, or the coherent communal knowledge of a specific worldview. For example, if the warrant is an ethical principle from Christianity, the backing would be the entire theological and philosophical tradition of Christianity, which has established that principle. The backing represents the cumulative wisdom of a tradition, and while it provides authority, it is not immune to internal debate and ongoing interpretation.

Rebuttal encourages students to acknowledge and respond to counterevidence, alternative interpretations, and opposing viewpoints. In a CRE-adapted framework, the rebuttal is the practical enactment of epistemic relativity. It identifies conditions that challenge the claim, alternative interpretations, or counter-arguments that limit the claim's certainty. The

goal is not simply to challenge the claim, but to deepen inquiry and prevent early epistemic closure, whereby students become resistant to evaluating alternative perspectives (Ashley, 2005). While scientific rebuttals often aim for empirical falsification, rebuttals in RE focus on the contestability of the warrant or the ambiguity of the data. This involves highlighting alternative hermeneutical frameworks (inter-worldview), recognising internal diversity (intra-worldview), or assessing problematic existential or moral consequences. Engaging with rebuttals demonstrates epistemic humility and is essential for a firm judgmental rationality to weigh explanatory power despite plausible alternatives. The presence of a strong rebuttal necessitates a qualifier. For example, a rebuttal to the claim that "The purpose of medicine is to alleviate suffering" might be "Unless alleviating suffering requires actions (such as euthanasia) that violate the principle of the sanctity of life".

The integration of CRE principles into Toulmin's model yields a framework uniquely suited to the epistemic character of religious inquiry. This specific adaptation is necessary because generic argumentation frameworks and alternative pedagogical approaches prevalent in RE often lack the capacity to handle the specific demands of evaluating religious truth claims carefully. This substantive, epistemological focus distinguishes the CRE adaptation from generic argumentation frameworks established in educational research. Theories such as Pragma-Dialectics (Van Eemeren & Grootendorst, 2003) and Walton's Dialogue Theory (2000) offer valuable procedural rules for fostering civil discourse, negotiation, and consensus-building. However, because their primary goal is often resolution through procedural rules or successful persuasion rather than intrinsic epistemic justification (Biro & Siegel, 2006), they fall short of evaluating the substance and epistemic grounding of religious truth claims. At this point, the proposed CRE-adapted framework aims to guide students beyond simple persuasion to a disciplined, empathetic evaluation of competing religious and non-religious claims.

4.4.2 Pedagogical Translation: The Five Moves

Translating this CRE-adapted model into classroom practice requires a set of specific pedagogical moves. While the structural prompts driving these moves are widely used in subjects such as science, history, and philosophy, what makes them CRE-informed is the kind of justification pupils are asked to provide and evaluate. The moves are designed to help pupils (i) identify relevant sources, (ii) articulate warrants and underlying commitments, and (iii) assess and qualify claims through epistemic humility. The Islamic jurisprudence and secular environmental ethics example below are offered as analytical illustrations of these moves.

Move 1: The Grounding Move

This move establishes that claims are not simply the expression of personal opinions. It requires students to ground their claims in evidence appropriate to the inquiry, such as scripture, tradition, communal practice, historical and philosophical reasoning, and interpreted experience as well as scientific reports or empirical observation in some worldviews. It helps students approach questions of reality, meaning, and value through culturally mediated assumptions, whether religious or secular. The teacher asks what kind of evidence is being used, moving students' focus from belief to the reasoning behind it. Typical prompts include the following: "What are you basing that on?" "What is that belief

based on?" "What kind of data are you using here: text, tradition, experience, reason, history, or empirical report?"

For example, when teaching a unit about Islam and art, a student might say, "In Islam, you are not supposed to create pictures of people or animals". Using the grounding move, the teacher might respond, "That is a clear position. Can you point to a specific scriptural text or practice that leads you to that conclusion?" This allows the student to think about or search for an example, citing a lived communal practice, "We do not hang pictures of faces in our house". The student might also refer to a scriptural source, a hadith that states that angels do not enter a house if there is a picture inside.

Similarly, in a discussion of a non-religious worldview such as secular environmentalism, a student might argue "We have a moral obligation to completely stop using fossil fuels". The teacher might ask: "What data are you basing that on; scientific findings, lived experience, policy commitments, or something else?" This may lead the student to cite empirical data, such as IPCC scientific reports on carbon emissions and climate change, along with other evidence, including experiences of affected communities, human rights–based claims, and policy documents such as the Paris Agreement.

Move 2: The Connecting Move

The connecting move addresses a common difficulty in structuring a well-supported argument, that is, explaining the reasoning that links data to a claim. This requires students to articulate their warrant, the underlying rule, principle, or logical link and moves the discussion from assertion to reasoned evaluation. In doing so, the student practices judgmental rationality by articulating the moral, existential, or theological explanatory power of their reasoning within the worldview in question.

Empirical research suggests identifying and articulating the reasoning linking evidence to claims is a persistent area of difficulty. McNeill et al. (2016) show this especially clearly in relation to teachers' difficulties in supporting and evaluating students' reasoning. Without explicit pedagogical scaffolding, students are highly inclined to use prejudice and intuition (Zhu & He, 2022) as well as disputative argumentation (Asterhan & Schwarz, 2016), rather than making evidence-based decisions and being open to alternative perspectives. Given the significant cognitive demands involved in identifying underlying principles, teachers need to explicitly scaffold this process through targeted questioning strategies. Within the RE context, to achieve this, the teacher can use targeted epistemic prompts, such as "How does that evidence support your claim?" "How do you know that?" and "What principle makes that a good reason for your conclusion?"

To continue with the Islamic example, once a student has provided their data, for instance, citing the above hadith about angels not entering a house with pictures in it, the teacher then asks the student: "That is important evidence. But can you explain how this Hadith leads to the conclusion that all images of people and animals are forbidden?" "What underlying principle makes this a general rule for art?" "What specific concern is this prohibition intended to address?" This encourages the student to articulate their warrant. Students with an Islamic faith will probably draw on their communal knowledge, such as the principle of avoiding *shirk* (idolatry) and the spiritual danger of attempting to imitate the Creator.

In the environment example, the teacher might ask: "How does the scientific fact of global warming make it a moral obligation to act? What ethical principle connects those

scientific facts to moral responsibility?" The student will have to identify a warrant, such as reducing harm, protecting vulnerable populations, or preserving the conditions for human and ecological flourishing.

This move is also essential when students use personal experience as data. While the grounding move establishes the experience, the connecting move examines how it is being interpreted. The teacher can facilitate this by asking how the personal experience connects to broader communal narratives or established principles, so that it is not offered as a simply subjective report.

Move 3: The Engaging Move

This move examines the backing, the foundational assumptions that support the warrant and requires students to consider the broader theological, philosophical, or ethical frameworks when situating an argument. The focus is on foundational justification and internal coherence, identifying the authoritative source that validates the warrant within that worldview. This move also promotes the epistemic virtues of attentiveness and reasonableness that are central to CRE, as it requires students to accurately understand another's argument before critiquing it. The teacher can use prompting questions such as, "Why is this principle considered authoritative within this tradition?" "What foundational belief supports this line of reasoning?" "What wider worldview makes this argument coherent?"

In the art example, a student may argue that figurative illustrations are forbidden based on the warrant of avoiding idolatry (shirk). The teacher might ask: "You have identified the principle of avoiding *shirk*. Why is this principle so fundamental in Islam?" "What core theological doctrine supports the prohibition of idolatry?" This prompts the student to identify the Islamic doctrine of *Tawhid* (the absolute oneness and uniqueness of God) as the backing of the argument. This establishes the essential distinction between the Creator and the creation and why imitating the divine creative act is regarded as theologically problematic.

For the secular environmental example, the teacher applies the same line of questioning to make sure that students distinguish between empirical facts and philosophical backings. The teacher asks, "You identified the principle of preserving the earth. Why is this principle considered authoritative within this worldview?" "What deeper philosophical commitments, about human nature, scientific reason, or the physical universe, support this ethical stance?" This pushes the student to explain commitments such as secular humanism or biocentrism. It also elucidates that secular arguments, similar to religious ones, are built on deeper, axiomatic assumptions about reality and ultimate truth.

Move 4: The Humility Move

This move focuses on the rebuttal and the qualifier. It assesses the boundaries of the argument by introducing counter-evidence, alternative interpretations, challenging scenarios, and restricting conditions that complicate or challenge the claim. In CRE terms, it enacts epistemic humility and challenges premature closure, while still requiring students to make reasoned judgments. The aim is to consider whether alternative accounts suggest greater explanation, coherence, wider scope, or more fruitful moral implications. Empirical research demonstrates that students have particular cognitive difficulty when articulating alternative ideas and challenging their own arguments (Asterhan & Schwarz, 2016); hence, the teacher must explicitly facilitate this process. After a main argument is presented, or when discussion becomes too polarised, the teacher can invite rebuttals by asking: "What

is the strongest argument against your own position?" "Under what circumstances might your claim not be true?" "Is there another way to interpret the same evidence?" "Does that alternative explain the issue better, or does it leave something unresolved?"

In the Islamic example, the teacher may provide a set of materials so that rebuttals are grounded in accessible evidence rather than dependent on recall. For instance, the teacher might introduce Surah Saba (34:13), which mentions that statues were made for the Prophet Solomon, along with examples of figurative art in Islamic cultures, such as Ottoman miniatures. The teacher might ask: "Could someone claim that the original prohibition was not about illustration as such, but specifically about safeguarding against the danger of idol worship in early contexts?" After observing how Ottoman miniatures often employed a two-dimensional style to avoid realistic perspective or shadowing, the teacher might ask: "How did Ottoman artists understand the relationship between representation and tawhid?" This encourages students to offer reasoned rebuttals and develop qualifiers, for example by limiting the claim to certain contexts or distinguishing between forms of representation.

In the secular environmental debate, the teacher can present conflicting ethical priorities by asking the following: "Under what circumstances might an urgent and complete ban on fossil fuels become ethically problematic?" "Could this seriously harm poor nations that currently depend on cheap energy to deal with extreme poverty?" "Does a more gradual transition provide a better account of both climate responsibility and justice?" The teacher might then introduce the UN Sustainable Development Goals, which focus on the eradication of extreme poverty alongside climate action. This encourages students to qualify their original claims by acknowledging the tension between ethical responsibilities and global economic justice. The student is then encouraged to formulate a qualifier, for instance: "Fossil fuels should be gradually eliminated to protect the planet, on the condition that developed countries help finance and support the poorer countries' energy transitions to avoid economic disruption and social harm".

Move 5: The Synthesising Move

This concluding move reframes the purpose of argumentation away from a competitive debate to a collaborative inquiry. This is supported by empirical studies, as McNeill et al. (2016) suggest that aiming for persuasion in argumentation may result in competitive debates where students strictly defend their views rather than engaging "in a collective effort to achieve the best idea" (p. 281). Moreover, recent studies on socio-scientific and ethical argumentation confirm that when teachers utilise structured methods to frame synthesis as a learning outcome in co-constructive debates, students are more likely to shift away from intuitive, perceptual decision-making toward open-minded and rational reasoning (Zhu & He, 2022).

Within the context of RE, this collaborative sense-making reflects what CRE terms cumulative discernment, in which students' initial beliefs are refined through progressive comparison, critique, and reflection (Wright, 2016). Rather than encouraging adversarial and competitive arguments, this synthesising process promotes intellectual virtues like epistemic humility and dialogical empathy (Cooling, 2025) that are needed in a plural democracy. Importantly, this does not lead to a mere description, but to a provisional, reasoned, and qualified conclusion that can be justified according to data, warrants, backing, and rebuttals developed in the earlier moves. The teacher then asks students to synthesise the whole argument: "Given what we have discussed, what is your best justified claim? How would you qualify it? What would challenge it?"

After the discussion on figurative art in Islam, the teacher might conclude by saying "We have explored different sources and interpretive approaches. What is your current view about figurative art in Islam, and how would you qualify it based on what we have considered? Which sources matter most in your reasoning, and why?" Students might conclude, for example, that a narrower prohibition is justified on certain interpretative conditions, or that a context-specific permission is defensible, assuming that concerns about idolatry and representation are addressed.

In the secular environmental example, the teacher might similarly reframe the debate: "We have considered the scientific evidence and the competing ethical priorities. What is your refined claim about fossil fuels, and what other conditions or safeguards would you think of?" Students might then explain a reasoned position that connects urgent climate responsibility with justice-based restrictions, such as just transitions, supporting low-income countries. This shows how secular ethical reasoning also involves considering competing moral values to reach a more differentiated and defensible conclusion.

5 Conclusion

This paper argues that the direct application of scientific argumentation models to RE is problematic and risks epistemic reductionism, that is, evaluating religious claims by purely scientific standards. The analysis establishes that science and religion function within distinct epistemological foundations, with science privileging empirical evidence while religions and worldviews are grounded in interpretive and experiential sources. This fundamental difference produces a significant pedagogical challenge, consistent with empirical findings showing that students often struggle to build high-quality arguments, particularly well-supported warrants, in RE, where the evidence criteria are inherently far more complex and less standardised compared to science.

The distinct epistemic characteristics of science and religion highlight the critical need for a domain-specific approach to argumentation in RE. By drawing on the pedagogical structure of argumentation found in science classrooms and re-specifying it through the lens of CRE, this paper provides a framework designed to enrich engagement with diverse religious and secular truth claims in RE. The CRE-adapted argumentation framework is presented not only as a structural tool but as a pedagogical framework for exploring the epistemic character of religious inquiry. By committing to objective truth with an acknowledgment of fallible and contingent human knowledge, the framework enables a more disciplined form of critical engagement. The principle of judgmental rationality reframes classroom debate away from developing basic critical thinking skills and toward a collaborative and comparative evaluation of competing truth claims. It offers a distinct strategy to transform informal, emotive, and intuitive reasoning into well-structured arguments. Ultimately, this approach helps students recognise that religious and ethical claims can be examined and discussed with the same rational scrutiny and respect for evidence as scientific theories. It is also intended to support more reflective discussion of the relationship between scientific and religious ways of knowing, without collapsing one into the other.

While this theoretically justified framework has broad practical implications for classroom practice, teacher education, and curriculum development, it is intellectually demanding, and its success is dependent on how it is addressed in actual classrooms.

Further empirical research is needed to examine its implementation and effectiveness across diverse classroom settings, such as its applicability to wider religious and secular worldviews. Future studies could explore what kinds of professional development help teachers to use these pedagogical moves effectively and how the framework might be scaffolded through levelled resources for different age groups and students' prior understanding. Such work would help evaluate the extent to which this proposed model can support argumentation in RE that is both epistemically domain-sensitive and pedagogically practical.

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Declarations

Competing interests The authors declare that they have no conflict of interest.

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