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RESEARCH ARTICLE

Section: *Digital Humanities***Dialogic critical reading in smart classrooms: IRF configurations and student response quality**Asep Purwo Yudi Utomo^{1*}, Ngabiyanto², Tutik Wijayanti², Muhammad Feriady³, Rossi Galih Kesuma⁴ & Riri Kumalasari¹¹Faculty of Languages and Arts, Universitas Negeri Semarang, Indonesia²Faculty of Social and Political Sciences, Universitas Negeri Semarang, Indonesia³Faculty of Economics and Business, Universitas Negeri Semarang, Indonesia⁴Faculty of Education and Psychology, Universitas Negeri Semarang, Indonesia*Correspondence: aseppyu@mail.unnes.ac.id**ABSTRACT**

Critical reading in technology-rich classrooms depends not only on access to digital texts but also on how classroom talk organizes interpretation, evidence, and evaluation. This study maps Initiation-Response-Feedback (IRF) configurations in 260 interaction units observed across five higher-education classes and seven meetings in a smart-classroom setting. A descriptive qualitative classroom discourse analysis coded each unit for structural configuration, initiation, response, feedback, participation, and response quality. Frequencies describe corpus tendencies and do not test causal relationships. Complete IRF was the most frequent configuration (50.38%), while IRFR (22.31%) and repeated IRF (16.15%) documented substantial exchange extension. Reflective/open initiation was the leading initiation function (33.85%); reflective and elaborative responses together accounted for 84.62% of the corpus. Elaborative expansion was the most frequent feedback function (46.92%), and 85.77% of units showed moderate or active participation. Representative sequences indicate that IRF became more dialogically productive when follow-up moves reopened the exchange, returned students to textual evidence, and prompted comparison or revision. Shared displays and annotations served as contextual resources in selected sequences, but technology was not analyzed as an independent causal factor. The study operationalizes dialogic expansion as a lens for distinguishing structurally complete exchanges from those that increase students' epistemic work. It also reframes the smart classroom as an interactional context whose pedagogical value depends on lecturer interactional competence.

KEYWORDS: classroom discourse analysis, critical reading, dialogic interaction, Initiation-Response-Feedback, smart classroom; student response quality

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1. Introduction

Critical reading has become a central educational capability because contemporary readers encounter texts that are abundant, multimodal, algorithmically circulated, and frequently contested. In this environment, comprehension cannot be reduced to locating explicit information. Readers must assess claims, identify the positioning embedded in lexical and rhetorical choices, compare evidence, and justify interpretations. Critical reading is therefore both cognitive and social: it develops through engagement with texts, but it is made visible and refinable through discourse with others (Alexander, 2020; Aukerman & Schuldt, 2015; Walldén, 2024). Classroom interaction matters because students learn not only what a text says but also what counts as a defensible interpretation, how evidence is invoked, and how disagreement is managed. Recent evidence from Indonesian higher education similarly conceptualizes critical thinking as a multidimensional construct produced through the interaction of cognitive reasoning, linguistic mediation, and cultural interpretation (Sholeh et al., 2026).

This dialogic dimension is particularly important in higher education language courses, where students are expected to move from comprehension toward evaluation and argumentation. Barak and Lefstein (2022) describe productive reading discussion as a stance that opens a text for examination rather than treats it as a container of predetermined answers. Similarly, Meston et al. (2022) show that academic discussion can distribute agency when students are invited to develop, challenge, and refine ideas. Critical reading thus requires an interactional architecture in which questions create interpretive space, responses display reasoning, and follow-up moves press for clarification or textual warrant.

Smart classrooms add a technological layer to this architecture. Interactive screens, shared annotations, polling tools, learning management systems, and digital text displays can make evidence visible and allow multiple interpretations to be compared in real time. Yet technological availability does not guarantee pedagogical transformation. Ayuningtyas and Rakhmawati (2026) argue that technology becomes meaningful only when it is integrated with pedagogical and contextual knowledge, while Fauzan et al. (2026) similarly show that immersive tools depend on task design and cognitive support. A smart classroom should therefore be understood less as a collection of devices than as an interactional ecology in which material affordances and discourse practices condition one another.

Within that ecology, lecturer talk remains consequential. Questions can invite interpretation or constrain students to recall; feedback can close a sequence with evaluation or reopen it by requesting evidence, comparing viewpoints, and redirecting attention to the text. Research on classroom discourse has long demonstrated that pedagogical opportunities are produced turn by turn (Rex & Green, 2008; Walsh, 2013). Directive and questioning practices can also support literacy when they guide participants toward reflection rather than mere compliance, as Wardani and Azizah (2025) found in their analysis of educational podcast discourse. The central issue is therefore not whether technology is present, but how interaction uses technological resources to extend students' epistemic participation.

The Initiation-Response-Feedback framework provides a useful entry point for examining this process. Sinclair and Coulthard (1975) identified a recurrent triadic exchange in which a teacher initiates, a student responds, and the teacher follows up. The framework has often been criticized because closed initiation and evaluative feedback may preserve teacher control (Ong, 2019; Putri et al., 2021). Nevertheless, the triadic structure is not intrinsically monologic. When initiation is authentic, responses are taken up, and feedback prompts further reasoning, IRF can develop into extended configurations such as IRFR or repeated IRF cycles. The analytic question is thus not whether IRF occurs, but what interactional work each move performs.

Existing studies have examined IRF in EFL classrooms, reading lessons, and teacher-student interaction (Aini et al., 2024; Putri et al., 2021; Yang & Tao, 2018), whereas research on technology-mediated interaction more often emphasizes virtual participation, infrastructure, engagement, or technology acceptance (Tjalla et al., 2023). These strands rarely converge at the level of fine-grained discourse in technology-rich critical-reading instruction. Consequently, two issues remain underexplored: how triadic exchanges are extended through uptake and follow-up, and how response quality can be represented within the same coding architecture. A further problem is the tendency to treat complete IRF as evidence of productive interaction, even though a formally complete sequence may close with a minimal correctness judgment, whereas an extended sequence may generate comparison, textual warrant, and revision.

This study addresses these gaps by analyzing 260 interaction units from smart-classroom critical-reading sessions. It distinguishes structural configuration from pedagogical function and examines initiation, response, feedback, participation, and response quality within a single descriptive coding architecture. The study is guided by three questions: (1) What IRF and extended-IRF configurations characterize critical-reading interaction in a smart-classroom setting? (2) How are the pedagogical functions of initiation, response, and feedback distributed across the corpus? (3) What levels of student participation and response quality are visible in the observed interaction units?

The study operationalizes dialogic expansion as an analytical lens for identifying the point at which an IRF exchange is reopened through uptake, redirection, comparison, or a follow-up response. This lens shifts evaluation from structural completeness to interactional productivity without assuming that every longer exchange is inherently dialogic. It also positions smart-classroom technology as a contextual amplifier of pedagogical choices rather than an independent cause of critical learning. The resulting account is relevant to classroom discourse analysis, critical literacy, and technology-enhanced language education because it specifies how digital resources become consequential through the sequencing of talk.

2. Literature Review

2.1 *Critical Reading as Dialogic and Epistemic Practice*

Critical reading involves more than skepticism toward a text. It is an epistemic practice through which readers examine how knowledge claims are constructed, supported, and positioned. Students must identify propositions, trace evidence, recognize authorial stance, and decide whether an interpretation is warranted. Walldén (2024) emphasizes that whole-class reading can either reproduce given meanings or create space for students to challenge them. The difference lies partly in how classroom discourse assigns epistemic roles: students may be positioned as answer providers, or as interpreters entitled to propose and defend readings.

Dialogue supports this shift because it externalizes otherwise private reasoning. When a student explains why a phrase signals bias, another participant can question the inference, request evidence, or offer a competing interpretation. Aukerman and Schuldt (2015) found that dialogically organized classrooms altered students' perceptions of their reading ability and epistemic participation. Barak and Lefstein (2022) likewise show that opening texts for discussion requires teachers to treat ambiguity as an intellectual resource. Mercer et al. (2020) place such exchanges within a broader research tradition on dialogic education, while Baffy (2018) demonstrates how constructed dialogue can socialize students into academic discourse. Under these conditions, critical reading becomes a collective practice of warranting rather than a sequence of individual answers.

Question design is central to that practice. Referential or authentic questions do not have a single teacher-known response and therefore create greater room for explanation (Brock, 1986). Levine et al. (2022) demonstrate that teachers' questions about literature distribute authority differently depending on whether authenticity and interpretation are genuinely invited. Closed questions remain useful for orienting students to textual details, but critical reading depends on movement toward questions that require comparison, evaluation, and evidence. This concern is reinforced by evidence from Indonesian language textbooks, where weak scaffolding coincided with a predominance of lower-order tasks and limited opportunities for evaluation and creation (Pamungkas et al., 2025b).

2.2 *Smart Classrooms as Interactional Ecologies*

Smart classrooms are often defined through infrastructure, but an affordance becomes pedagogical only when it changes what participants can notice, do, and discuss. A shared display can stabilize a passage as a common object of attention; annotation tools can expose the evidential basis of a claim; polls can reveal disagreement that would otherwise remain invisible. Zhan et al. (2021) show that smart-classroom environments can alter teacher-student interaction sequences, while MacLeod et al. (2018) report that students value smart-classroom features when they support flexibility, interaction, and access rather than novelty alone.

Recent language and literary education research reinforces this relational view. Ayuningtyas and Rakhmawati (2026) conceptualize technology integration through a TPACK-based model that links technological, pedagogical, and contextual knowledge. Fauzan et al. (2026) report that augmented-reality literary learning can support cognitive engagement, but the effects depend on how digital materials are aligned with tasks. These

studies caution against technological determinism. The smart classroom does not itself produce criticality; it expands the repertoire of semiotic and interactional resources from which a lecturer designs participation. Related humanities-education studies likewise show that digitally mediated learning becomes more productive when multimodal resources are connected to reflective engagement, iterative feedback, and purposeful interaction (Pamungkas et al., 2025a; Sudigdo et al., 2026).

The term interactional ecology captures this interdependence. The visible text, the distribution of turns, the lecturer's question, the student's response, and the follow-up move jointly shape the learning opportunity. A poll showing divided judgments, for example, has little critical value if the lecturer simply announces the majority answer. It becomes productive when the distribution is used to solicit reasons, compare textual evidence, and invite revision. At the institutional level, the pedagogical realization of these affordances is also conditioned by educator digital competence, strategic alignment, and an adequate analytics ecosystem (Indarti et al., 2026).

2.3 IRF, Follow-Up, and Dialogic Expansion

The IRF exchange has been one of the most durable models in classroom discourse analysis. Its strength is descriptive economy: it identifies who opens an exchange, how another participant responds, and how the first speaker evaluates or develops that response (Sinclair & Coulthard, 1975). Its limitation is that the same three-part structure can support very different pedagogies. A closed factual question, a one-word response, and a correctness judgment are structurally complete but interactionally thin. An open question, an evidence-based response, and a follow-up request can initiate a longer chain of reasoning.

Walsh (2013) describes classroom interactional competence as the ability to use talk in ways that are aligned with pedagogical goals. From this perspective, feedback is not a terminal category but an interactional hinge. Elaborative feedback may reformulate an idea, request textual warrant, redirect attention, or invite another student to respond. Borden (2022) similarly shows that accomplished language teachers build discourse communities by extending student contributions rather than merely judging them. When a follow-up generates another student move, the sequence becomes IRFR; when a topic is developed through successive cycles, it becomes repeated IRF.

This study uses the term dialogic expansion as an operational lens for these transformations. The term does not claim that every longer exchange is educationally superior or introduce a wholly separate discourse category. Rather, it identifies whether a follow-up move creates a further opportunity for interpretation, textual warrant, comparison, or revision. This distinction is consistent with Howe et al. (2019), who show that productive classroom dialogue depends on specific forms of elaboration and engagement rather than talk quantity alone.

2.4 Analytical Framework

The analytical framework combines structural and functional coding. Structural coding distinguishes complete IRF, IRFR, repeated IRF, IR, and IF. Functional coding identifies what initiation, response, and feedback accomplish within an exchange. Response function and response quality are deliberately separated: the former captures the dominant interactional work of the student move, whereas the latter estimates the epistemic demand displayed in the contribution. Participation is coded only as observable involvement within the interaction unit and is not interpreted as a stable individual attribute. Table 1 summarizes the operational categories used in the analysis.

Table 1. Operational coding framework

Dimension	Categories	Operational indicator
Structural pattern	IRF; IRFR; repeated IRF; IR; IF	Presence and sequencing of initiation, response, feedback, and any further response within one interaction unit.
Initiation function	Reflective/open; focus-directing; prior knowledge; evaluation; discourse control	Dominant pedagogical work of the lecturer move: opening interpretation, directing attention, eliciting prior knowledge, checking performance, or controlling discourse.

Dimension	Categories	Operational indicator
Response function	Reflective; elaborative; minimal; no verbal response	Dominant student-move function: evaluative or metacognitive judgment (reflective), explanatory extension (elaborative), brief reply (minimal), or no verbal contribution.
Feedback function	Elaborative expansion; participation motivation; re-direction; evaluative affirmation; no explicit feedback	How the lecturer takes up, extends, redirects, evaluates, motivates, or leaves a response.
Participation	Passive; minimal; moderately active; active	Observable involvement within the interaction unit; not a stable individual attribute or measure of participation equity.
Response quality	Passive/minimal; reproductive; elaborative; performative-critical	Epistemic demand displayed: reproduction, explanation/connection, or warranted evaluation, comparison, qualification, and positioning.

Note. IRFR = initiation-response-feedback-response; repeated IRF = multiple IRF cycles developing one topic.

The framework deliberately separates form from function and applies one dominant code within each dimension. A complete IRF unit can contain either evaluative closure or elaborative uptake, while an extended unit can remain interactionally thin if it merely repeats prompts. When a contribution met more than one indicator, coding followed the function that best represented the move's principal pedagogical work. This combined approach reduces the risk of equating structural extension with cognitive depth.

3. Method

3.1 Research Design and Context

The study employed a descriptive qualitative design within classroom discourse analysis. Its purpose was to map recurring interactional configurations and interpret their pedagogical functions, not to test the causal effectiveness of smart classrooms. Frequency summaries were used as corpus descriptors that indicate prevalence; they were not treated as inferential evidence of relationships among technology, discourse patterns, participation, or reading outcomes. This combination of qualitative interpretation and descriptive counting is appropriate when systematic comparison is required without displacing the sequential and contextual character of classroom talk (Creswell & Creswell, 2023; Miles et al., 2020; Saldaña, 2021).

The setting was a higher-education course in Reading, Comprehension, and Criticism conducted in a smart-classroom environment at a public university in Indonesia. The room provided interactive screens, digital texts, shared annotation, polling functions, a learning management system, and media-based discussion tools. These resources were relevant because they allowed passages, annotations, and selected student responses to become shared objects during discussion. Technology was nevertheless treated as contextual infrastructure rather than an experimental intervention or an independently coded variable.

3.2 Corpus and Unit of Analysis

The analytical corpus comprised 260 structured observation records of classroom exchanges collected across five classes and seven meetings. The available records captured the sequence and pedagogical content of each exchange but did not retain individual-level identifiers. The sessions covered critical reading alongside related practices such as comprehension, close reading, creative reading, survey reading, scanning, skimming, and effective reading speed. These activities formed the instructional sequence through which students moved from locating information toward interpreting and evaluating texts.

An interaction unit began with a lecturer initiation and continued through the associated response and follow-up until the topic, task focus, or participation frame shifted. Not every unit contained all three canonical moves. Some ended after initiation and response (IR), while others contained an initiation followed by lecturer explanation without a verbal student response (IF). Extended units were coded as IRFR when feedback elicited a further response and as repeated IRF when several initiation-response-feedback cycles developed one topic. The corpus was analyzed at the interaction-unit rather than individual-student level. Accordingly, the frequency counts describe how often particular configurations appeared in the recorded exchanges; they cannot establish

the proportion of unique students who participated, individual learning trajectories, or equitable access to the conversational floor.

3.3 Coding Framework

Each unit received one dominant code on six dimensions: structural pattern, initiation function, response function, feedback function, participation level, and response quality. Initiation was classified as reflective/open, focus-directing, prior-knowledge elicitation, evaluation, or discourse control. Reflective/open initiation invited interpretation, evaluation, or justification, whereas focus-directing initiation oriented attention toward a passage, annotation, claim, or task feature. Responses were classified as reflective, elaborative, minimal, or non-verbal. Reflective responses displayed evaluation, stance, or metacognitive judgment; elaborative responses extended an idea through explanation, connection, or textual detail without necessarily adopting an evaluative position.

Feedback was coded as elaborative expansion, participation motivation, redirection, evaluative affirmation, or no explicit feedback. Participation scores ranged from passive to active and described observable involvement within the unit rather than a stable student trait. Response quality was coded separately as passive/minimal, reproductive, elaborative, or performative-critical. Reproductive responses restated textual or teacher-provided information; elaborative responses explained or connected ideas; and performative-critical responses evaluated a claim, compared alternatives, qualified an interpretation, or adopted a warranted position. The distinctions were operationalized through a coding guide containing definitions, decision rules, and examples.

3.4 Analytic Procedure and Trustworthiness

Analysis proceeded in five stages. First, the structured observation records were read in full to establish contextual familiarity. Second, exchange boundaries were checked and each unit was assigned a structural code. Third, initiation, response, feedback, participation, and response-quality codes were applied using the operational guide. Fourth, category frequencies and percentages were calculated to identify dominant and marginal tendencies. Fifth, contrasting excerpts were selected and interpreted in relation to the critical-reading task and the digital resources explicitly documented in each record.

Credibility was supported through repeated examination of each unit, code-recode consistency checks, comparison between the recorded exchange and its assigned functions, and maintenance of an audit trail containing the category guide, data table, and interpretive notes (Merriam & Tisdell, 2016; Miles et al., 2020). The excerpts in Section 4.4 are normalized English renderings of the structured observation records; they preserve the documented sequence and pedagogical function but are not presented as word-for-word audio transcripts. Because consistency was established through iterative code checking rather than fully independent double coding, no inter-rater reliability coefficient is claimed. This limitation is considered explicitly in the discussion.

3.5 Ethical Safeguards

The analysis was limited to non-interventional classroom interactions documented during routine teaching. Personal names, student identification numbers, class codes, and other potentially identifying references were removed before analysis and reporting, and speakers are identified only by pedagogical role. The absence of a formal ethics-approval or exemption identifier and a documented consent modality in the study records is disclosed transparently in the Declarations rather than reconstructed retrospectively.

4. Results

The results are organized around structural configuration, pedagogical function, and observable participation and response quality. Frequencies describe distributions within the 260 interaction units and should not be interpreted as causal effects or statistical associations among categories.

4.1 Structural Distribution of IRF Patterns

Complete IRF was the most frequent configuration, appearing in 131 units (50.38%). This pattern shows that lecturer initiation, student response, and lecturer follow-up remained the basic organizational rhythm of the

observed lessons. Extended patterns were nevertheless substantial: IRFR accounted for 58 units (22.31%), and repeated IRF accounted for 42 units (16.15%). Together, these two configurations represented 38.46% of the corpus. IR and IF were comparatively infrequent, indicating that most recorded exchanges included an explicit response and follow-up.

Table 2. Distribution of IRF configurations

Configuration	Frequency	Percentage
IRF	131	50.38
IRFR	58	22.31
Repeated IRF	42	16.15
IR	16	6.15
IF	13	5.00
Total	260	100.00

Note. Percentages are calculated from 260 interaction units. IRFR and repeated IRF are treated as extended configurations.

The distribution complicates a simple teacher-centered interpretation of IRF. Half of the corpus followed the canonical triad, while more than one third moved beyond a single triad through follow-up response or repeated cycles. Structural extension does not establish dialogic quality by itself; it identifies candidate sequences in which the interaction created additional space for reasoning.

4.2 Functions of Initiation, Response, and Feedback

Reflective/open initiation was the largest initiation category (88 units; 33.85%), followed by focus-directing moves (68; 26.15%). The first category invited students to explain, evaluate, or justify, whereas the second directed attention toward a passage, annotation, argument, or displayed feature. Prior-knowledge elicitation (43; 16.54%) and evaluative initiation (40; 15.38%) remained visible, while discourse-control moves were least frequent (21; 8.08%).

Table 3. Distribution of initiation, response, and feedback functions

Move	Function	Frequency	Percentage
Initiation	Reflective/open	88	33.85
	Focus-directing	68	26.15
	Prior-knowledge elicitation	43	16.54
	Evaluation	40	15.38
	Discourse control	21	8.08
Response	Reflective	114	43.85
	Elaborative	106	40.77
	Minimal	27	10.38
	No verbal response	13	5.00
Feedback	Elaborative expansion	122	46.92
	Participation motivation	50	19.23
	Redirection	46	17.69
	Evaluative affirmation	26	10.00
	No explicit feedback	16	6.15

Note. Each interaction unit received one code within each move-specific dimension. The response and feedback totals each equal 260.

Student responses were concentrated in reflective (114; 43.85%) and elaborative (106; 40.77%) categories. Together, these accounted for 84.62% of the corpus. Minimal responses constituted 10.38%, and units with no verbal response constituted 5.00%. The distribution indicates that the recorded exchanges frequently contained explanation or evaluative positioning, although the unit-level coding cannot show whether participation was distributed across the same or different students.

Feedback was dominated by elaborative expansion (122 units; 46.92%). These moves requested additional

evidence, reformulated a response, connected it to another passage, or prompted a follow-up contribution. Participation motivation (50; 19.23%) and redirection (46; 17.69%) were also common. Evaluative affirmation was limited to 26 units (10.00%), and 16 units (6.15%) contained no explicit feedback. Thus, 83.85% of the corpus involved feedback that expanded, motivated, or redirected rather than merely marked correctness.

4.3 Participation and Response Quality

Moderately active participation characterized 162 interaction units (62.31%), and active participation characterized 61 units (23.46%). Together, these levels represented 85.77% of the corpus. Minimal participation appeared in 24 units (9.23%), while passive participation appeared in 13 (5.00%). These figures describe the interaction unit rather than individual participation equity; a class can display many active exchanges while still concentrating turns among a smaller number of students.

Table 4. Student participation and response quality

Dimension	Category	Frequency	Percentage
Participation	Passive	13	5.00
	Minimal	24	9.23
	Moderately active	162	62.31
	Active	61	23.46
Response quality	Passive/minimal	13	5.00
	Reproductive	27	10.38
	Elaborative	99	38.08
	Performative-critical	121	46.54

Note. Participation is coded at the interaction-unit level. Response quality characterizes the observable discourse contribution, not an independent assessment of individual reading achievement.

Response quality showed a parallel concentration in higher-level categories. Performative-critical responses accounted for 121 units (46.54%), and elaborative responses accounted for 99 (38.08%). Reproductive responses represented 10.38%, and passive/minimal responses 5.00%. The combined 84.62% indicates that elaborative or performative-critical contributions were frequently coded in the observed corpus. It does not demonstrate that smart-classroom technology caused those responses or that all students achieved the same level of critical-reading performance.

4.4 Observation-Based Interactional Sequences

The excerpts below are normalized English renderings of the structured observation records. They preserve the documented sequence and pedagogical function but are not presented as verbatim audio transcripts. The cases were selected for analytical contrast rather than statistical representativeness.

Excerpt 1. Complete IRF with elaborative feedback

Lecturer: Which part of the text indicates the author's bias?

Student: The author uses the words *only* and *as if*. These expressions suggest a particular judgment toward one of the parties.

Lecturer: Good. Word choice can indicate authorial stance. Now examine the annotations displayed on the screen. Is there another word that strengthens your interpretation?

The initiation required an interpretive judgment rather than the retrieval of explicit information. The student supported the response with lexical evidence, while the lecturer's feedback affirmed the interpretation and redirected attention to the shared annotation layer. Although the unit was structurally coded as complete IRF, its final move opened a further evidential search. Any subsequent response fell outside the boundary of this coded interaction unit.

Excerpt 2. IRFR with a follow-up response

Lecturer: Why is the author's argument in the third paragraph unconvincing?

Student: The author presents an opinion but does not provide supporting data.

Lecturer: Compare it with the fifth paragraph displayed on the screen. Is the evidence stronger there?

Student: Yes. The fifth paragraph includes survey results, which make the argument more convincing.

In this sequence, feedback functioned as uptake rather than closure. The lecturer redirected the student to a contrasting passage and prompted an additional response. The second response refined the initial judgment by identifying differences in evidential support. The IRFR configuration therefore represents dialogic expansion because the follow-up move generated further comparison and more explicit warranting.

Excerpt 3. Repeated IRF as staged scaffolding

Lecturer: What is the main idea of this text?

Student: The author discusses the low level of reading interest among teenagers.

Lecturer: What causes does the author identify?

Student: The influence of social media and weak reading habits developed from childhood.

Lecturer: Are the proposed solutions sufficiently realistic?

Student: Some are realistic, but their implementation requires support from both schools and families.

The successive cycles moved from identifying the main idea to interpreting causes and evaluating proposed solutions. The pedagogical value of the sequence lay not in repetition itself, but in the progressively greater epistemic demand of each initiation. Repeated IRF thus operated as staged scaffolding that guided students from comprehension toward evaluative judgment.

Excerpt 4. IR without explicit feedback

Lecturer: What keywords did you identify in the second paragraph?

Students: Digital literacy, false information, and source evaluation.

Lecturer: Now, let us move to the next section.

The students provided a relevant response, but the lecturer's subsequent move functioned as a transition rather than feedback on the content of that response. The immediate topic shift left the significance of the identified keywords unexplored. Although this pattern supported lesson pacing, it offered limited opportunity to connect textual identification with a broader critical-reading judgment.

Excerpt 5. IF following the absence of a verbal response

Lecturer: Why does the author use statistical data in the opening section?

Student: [No verbal response]

Lecturer: Statistical data can create an impression of objectivity and suggest that the issue being discussed has a factual basis.

This sequence was coded as IF because the lecturer's initiation did not elicit a verbal student response and was followed by an explanatory move. The available observation data do not establish whether the silence resulted from question difficulty, insufficient wait time, uncertainty, or reluctance to participate. Nevertheless, the sequence illustrates how lecturer explanation can maintain instructional continuity while reducing students' opportunity to formulate and justify their own interpretations.

The lecturer supplied an interpretation after silence. The sequence may reflect question difficulty, limited wait time, or reluctance to speak, but the observation record does not permit a definitive explanation. The episode illustrates why access to smart-classroom resources does not remove the need for careful participation management.

Table 5. Analytical profile of representative interactional sequences

Pattern	Interactional movement	Pedagogical interpretation
IRF	Bias identified through lexical evidence; feedback directs attention to shared annotations.	Complete structure with an opening toward further evidential search.

Pattern	Interactional movement	Pedagogical interpretation
IRFR	Initial judgment is compared with a stronger evidential passage.	Feedback produces a follow-up response and sharper warranting.
Repeated IRF	Questions progress from main idea to cause and evaluation.	Successive cycles increase epistemic demand within one topic.
IR	Keywords are supplied, but the lecturer immediately changes topic.	Efficient pacing, with limited opportunity for elaboration.
IF	No verbal response; lecturer supplies the explanation.	Potential participation constraint; cause cannot be inferred from observation alone.

Note. The sequences are selected for analytic contrast rather than statistical representativeness.

Across the five sequences, the decisive difference was how the lecturer treated the student response. When the response became material for another interpretive action, the exchange expanded. When the lecturer changed topic or supplied the answer, the interaction retained instructional efficiency but reduced the student's opportunity to warrant, compare, or revise an interpretation.

5. Discussion

The findings demonstrate that Initiation-Response-Feedback remained the dominant organizational structure of critical-reading interaction while also providing a platform for dialogic expansion. Complete IRF accounted for half of the corpus, whereas IRFR and repeated IRF together represented 38.46% of all interaction units. This distribution distinguishes the persistence of lecturer-led sequencing from the assumption that such sequencing is necessarily closed, evaluative, or pedagogically restrictive. Sinclair and Coulthard's (1975) framework describes the architecture of classroom exchange but does not predetermine the epistemic quality of the moves within it. In this study, an exchange was interpreted as dialogically expansive when follow-up created another opportunity to justify an interpretation, compare textual evidence, reconsider an initial claim, or refine a judgment. The representative IRFR sequence illustrates this process: a comparison prompt transformed an initial evaluation into a more evidence-sensitive assessment. This interpretation is consistent with Alexander's (2020) conception of dialogue as cumulative and purposeful and with Howe et al.'s (2019) emphasis on elaboration and substantive engagement rather than talk volume. The relevant indicator is therefore not the number of turns alone but whether successive turns increase the epistemic work required of students.

The central mechanism in this expansion was feedback. Elaborative expansion was the most frequent feedback function, and 83.85% of the units involved elaboration, participation motivation, or redirection rather than simple evaluative affirmation. In conventional evaluative IRF, the final move often confirms whether a teacher-known answer is correct and closes the exchange. In the observed corpus, feedback more frequently requested additional evidence, redirected attention to a passage, prompted comparison, or generated a follow-up response. This pattern supports Walsh's (2013) account of classroom interactional competence, in which pedagogical opportunities are created through the teacher's ability to shape turns in relation to an immediate learning goal. Borden (2022) likewise identifies the extension of student contributions as a characteristic of strong language-teaching discourse. Such follow-up is particularly consequential in critical reading because an unsupported interpretation remains an opinion rather than a defensible argument. Feedback becomes a dialogic hinge between personal response and warranted judgment when it requires students to identify textual support, revise an inference, or account for competing interpretations.

In selected sequences, the smart-classroom setting supplied contextual resources that made texts, annotations, and competing interpretations jointly available. Shared screens and digital annotations allowed the lecturer to orient collective attention toward textual evidence without replacing students' interpretive agency. This observation is consistent with Zhan et al. (2021), who show that smart-classroom environments can reshape teacher-student interaction sequences, and with MacLeod et al. (2018), who report that students value smart-classroom features when they improve communication, accessibility, and collaborative engagement. The present data nevertheless support a mediational rather than causal interpretation: technology made evidence easier to display and coordinate in the documented episodes, but technology use was not coded as an independent dimension. The study therefore cannot estimate how often particular tools produced expansion or compare

technology-mediated with exclusively verbal exchanges. The presence of IR and IF patterns further illustrates the limits of technological affordance. A displayed text cannot independently create wait time, redistribute participation, or transform silence into inquiry. Ayuningtyas and Rakhmawati (2026) situate this issue within pedagogically grounded technology integration, while Fauzan et al. (2026) show that immersive tools require alignment with appropriate tasks. Wardani and Azizah's (2025) analysis of directive speech acts similarly suggests that questions and directives contribute to critical literacy when they orient participants toward reflective action rather than passive compliance. Figure 1 synthesizes these tendencies as an analytical model rather than a tested causal pathway. This interpretation is reinforced by adjacent research showing that immersive and adaptive digital environments can support reflective literacy and iterative learning when technological features are integrated with carefully designed feedback and interaction (Pamungkas et al., 2025a; Sudigdo et al., 2026).

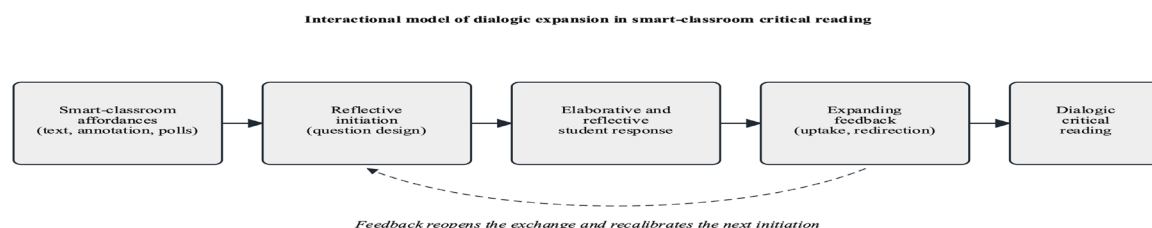


Figure 1. Interactional model of dialogic expansion in smart-classroom critical reading

Note. The model is an analytical synthesis of observed tendencies, not a causal pathway tested through experimental or correlational analysis.

The model clarifies that technology should be treated as a contextual amplifier of pedagogical interaction rather than an autonomous driver of critical-reading development. Each stage depends on an instructional decision concerning what evidence is displayed, what question is posed, how a response is taken up, and whether the exchange is reopened. Three implications follow. First, initiation should be designed as a progression rather than reduced to the indiscriminate use of open-ended questions. Focus-directing moves can establish a shared evidential object before reflective questions ask students to interpret its significance, as illustrated by the repeated-IRF sequence that moved from main idea to cause and evaluation. Second, feedback should be planned as uptake. Instead of ending with a brief affirmation, lecturers can request another passage, invite comparison, ask peers to challenge a line of reasoning, or display competing annotations. These moves make students' reasoning and use of evidence visible for formative assessment. Third, participation should be evaluated beyond aggregate activity. Although 85.77% of units were categorized as moderately active or active, unit-level frequencies cannot establish whether participation was equitably distributed. Written annotations or poll-based responses before oral discussion may broaden entry into evidence-based dialogue, especially for less confident students. The instructional objective is therefore not more technology, but a more inclusive and intellectually demanding route into critical textual discussion. The emphasis on progressively demanding questions is also consistent with evidence that language-learning materials can underrepresent evaluation and creation when instructional scaffolding is insufficient (Pamungkas et al., 2025b).

The findings should be interpreted within six limitations. First, the corpus was drawn from five classes in one institutional context and should not be generalized automatically to other smart-classroom settings. Second, the descriptive design lacked a conventional-classroom comparison and cannot establish that technology caused the observed response quality. Third, participation was coded at the interaction-unit level rather than longitudinally by individual student, limiting conclusions about equity, consistency of engagement, and access to the conversational floor. Fourth, the structured observation records did not retain participant counts, individual learning trajectories, or a separately coded measure of technology use. Fifth, the excerpts are normalized renderings of observation records rather than verbatim audio transcripts. Sixth, coding consistency was maintained through repeated code checking rather than independent double coding, so no inter-rater coefficient is available. Future research should compare sequences across smart and conventional classrooms, track who gains and retains the floor, and test whether particular initiation-feedback combinations precede performative-

critical responses. Sequential and mixed-method designs could combine discourse data with interviews, audio-video transcripts, screen-activity logs, and learner-generated annotations to clarify how students use displayed evidence when constructing and revising interpretations.

6. Conclusion

This study examined how critical reading was interactionally organized across 260 observation-based classroom exchanges in a smart-classroom setting. Complete IRF remained the dominant structure, while the substantial occurrence of IRFR and repeated IRF showed that triadic organization frequently extended into further reasoning rather than ending in brief evaluation. Reflective/open initiation, reflective and elaborative responses, and expanding feedback formed the most prominent functional profile. Participation and response-quality distributions also showed that the recorded units frequently involved active engagement and interpretive work beyond reproductive reading. These findings indicate that structural completeness alone is an insufficient indicator of discourse quality. Dialogic expansion provides a more discriminating analytical lens because it asks whether follow-up reopens the exchange, returns students to textual evidence, and supports comparison, justification, or revision.

The study therefore positions smart-classroom technology as an interactional resource rather than an independent driver of critical reading. Digital texts, shared annotations, polls, and response displays can make claims and evidence publicly accessible, but their pedagogical value depends on lecturer interactional competence, particularly question design, response uptake, and evidential follow-up. For language educators, the practical priority is to organize learning around warranted interpretation: shared digital resources should establish common evidential objects, questions should progress from orientation toward analysis and evaluation, and feedback should require students to explain how their interpretations are supported. Under these conditions, IRF can function not merely as a mechanism of classroom control but as a flexible discourse structure for developing critical, dialogic, and evidence-based reading.

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Declarations

Ethics statement

This study involved non-interventional observation of routine classroom activities and introduced no experimental treatment. A formal ethics-approval or exemption identifier is not available for this study. All reporting was restricted to anonymized interactional material.

Informed consent

The consent modality was not documented in the available study records; accordingly, the manuscript does not specify written or oral consent. All excerpts were anonymized before analysis and reporting. Personal names, student identification numbers, class labels, and other potentially identifying references were removed, and speakers are identified only through generic role labels such as “Lecturer” and “Student.”

Data availability

The classroom interaction records are not publicly available because they contain potentially identifiable contextual material. De-identified coding summaries may be obtained from the corresponding author on reasonable request, subject to institutional and participant-confidentiality requirements.

Conflict of interest

The authors declare no conflict of interest.

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Author contributions.

All authors contributed substantially to the conception or design of the study, the analysis or interpretation of the data, and the critical revision of the manuscript. All authors approved the final version and accept accountability for the integrity of the work.

Declaration of generative AI and AI-assisted technologies in the writing process

The authors used Grammarly and OpenAI’s ChatGPT to improve English-language expression, structural consistency, and manuscript formatting. These tools were not used to create, fabricate, or independently code the empirical dataset. All AI-assisted outputs were critically reviewed and revised by the authors, who take full responsibility for the final manuscript.

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