RETHINKING HOMEWORK BETWEEN DIALOGIC SPACE AND INSTRUCTIONAL DESIGN

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ABSTRACT
This paper explores the role of homework within instructional design, framing it not merely as an assessment tool, but as a dialogic space where implicit conceptions of learning, design choices, and student agency intersect. Homework is understood as a mechanism through which pedagogical intentionality becomes visible, clarifying the relationship between objectives, activities, and evaluation. The unit of analysis is the Task-Mediated Design Episode (TMDE), observed as a situated configuration of practices, discourses, and artifacts. Addressing the limited attention this topic has received in Italian literature and its often individual, non-collegial management, this project aims to rethink homework as a lever for dialogic, reflective, and inclusive teaching. It also explores the integration of Artificial Intelligence tools to support teachers in designing tasks aligned with learning goals.

KEYWORDS
Homework; Instructional Design; Dialogic Space; Dialogic Teaching; TMDE.

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1. Introduction and Theoretical Framework: The Pedagogical Ambivalence of Homework

Historically, homework has been a ubiquitous instructional resource in global education systems. For decades, it was regarded as a 'natural' and unquestionable component of schooling, a routine uncritically accepted by teachers, pupils, and families (Cooper, 1989). Classically defined as a set of tasks assigned by teachers to be completed outside school hours, without direct and simultaneous teacher guidance during execution (Cooper, 1989; Yavich & Davidovitch, 2020), homework assumes various structural forms, ranging from repetitive worksheets to essay, numerical exercises, and home reading tasks.

In recent years, however, homeworking practices have undergone a crucial epistemological shift, moving from the background to the forefront of public and academic debate. This paradigm shift is closely linked to profound changes in contemporary parenting models. Driven by an expanded home-school partnership and highly protective educational orientations, homework has transformed from a quiet, intimate, and independent students' activity into a full-blown 'family enterprise'. It functions as a daily barometer that heavily impacts household routines, alters the family's emotional dynamics, and fuels persistent intergenerational friction, proving to be a deeply divisive and polarising issue (Gill & Schlossman, 2004; Athienitis, 2026).

When analysed through the lens of teachers' micro-instructional design, extending classroom practice beyond the physical and chronological boundaries of the school reveals itself as an intentional methodological choice. Homework acts as a programmatic interface between the formalised school space and the student's daily life context, mirroring teachers' epistemological stances, professional routines, and pedagogical beliefs (Avci et al., 2025).

1.1. The pedagogical dilemma between cognitive constructivism and neurocognitive saturation

The scientific literature on the subject is structurally divided between proponents and critics of the practice, fuelling a debate rich in epistemological and methodological nuances (Hattie, 2009; Holte, 2016). Proponents emphasise its value as a catalyst for academic success, highlighting how it enables 'time-on-task' to be extended beyond the formal and restrictive confines of school (Perrenoud, 1995). From this perspective, homework promotes the consolidation of knowledge and the acquisition of effective study habits, organisational skills, strategic planning, a sense of personal responsibility, self-efficacy and cognitive independence (Cooper, 2007; Cooper et al., 2006; Corno & Xu, 2004; Epstein & Van Voorhis, 2001). Within the framework of cognitive constructivism, the act of tackling a task independently fosters the student's transformation into a well-rounded and self-directed individual (Marentič Požarnik, 2003), stimulating an active approach that can be summarised as the cross-curricular macro-competence of 'learning to learn'. When the teacher designs the task as a problem-solving or critical thinking activity based on Piaget's theory, they view the space outside the school as a laboratory for active assimilation, in which the pupil interacts with the environment to restructure their pre-existing cognitive schemas through processes of accommodation (Piaget, 1970).

Conversely, the persistence of a neo-behaviourist approach can be observed in cases where the teacher's lesson planning prioritises tasks centred on mechanical repetition, algorithmic automation and targeted practice, viewing the home environment primarily as a place for the passive consolidation of procedures learnt in the classroom, such as mathematical formulas or syntactic rules. In an approach focused on metacognitive development, however, out-of-

school activities are planned as a means of fostering the student's autonomy, challenging them to develop skills in self-regulation and monitoring their own learning process. In contrast, a significant and authoritative body of critical literature highlights the fragility of the empirical evidence regarding the actual effectiveness of homework, the purely cognitive effects of which appear to be virtually non-existent or negligible for primary school students (Hattie, 2009).

On the other hand, the cost in terms of stress, emotional exhaustion, frustration and interpersonal tensions that this practice systematically imposes on the family unit is clearly evident (Marujo et al., 2002; Meirieu, 1998; Silva, 2004). In this regard, there is discourse surrounding a phenomenon of 'saturation effect', in which an excess of homework results in physical and psychological exhaustion, thereby depriving children of their leisure time and, as Holte (2016) has vigorously contended in the Scandinavian context, jeopardising the quality of childhood and the right to engage in play. From a methodological perspective, the nature of the cognitive load required and the scope for action afforded to the pupil is determined by the choice of task type. The teacher must strike a balance between memory-based activities aimed at reproduction; procedural tasks designed to apply structured algorithms to arrive at unambiguous solutions; comprehension tasks centred on the active transformation of data to solve new problems; and tasks focused on the free expression of personal preferences (Doyle, 1983).

A review of the relevant literature indicates a particular pedagogical risk that is inherent in the planning phase: an excess of rigidity or, conversely, a high degree of ambiguity in the formulation of comprehension tasks can result in students constantly seeking confirmation and assistance from adults. This phenomenon engenders a methodological impasse that metamorphoses a potentially heuristic activity into a purely procedural, externally directed

exercise, thereby subverting autonomy, engendering avoidance strategies or emotional detachment from the act of learning, and drastically curtailing the student's creativity (Frost, 2020). This drift is further exacerbated by dysfunctional teaching practices, such as the use of tasks for punitive purposes or, conversely, as a reward system – practices that the extant literature openly condemns as they foster negative attitudes and undermine students' intrinsic motivation (Senekovič, 2007; Jackson & Harbison, 2014).

1.2. Homework as a Reproducer of Socio-Cultural Inequalities and its Developmental Impact

The core of this pedagogical critique lies in the potential of traditional homework assignments to reproduce and exacerbate systemic socio-cultural disparities. Because homework is undertaken in structurally asymmetrical domestic environments, task success depends heavily on parents' cultural and their capacity to act as competent instructional partners. As highlighted by Rønning (2011), culturally and socially disadvantaged children receive less home-based guidance and cognitive stimulation, turning homework into a regressive mechanism that perpetuates and widens achievement gaps rather than narrowing them. Many students are thus left to tackle assignments in isolation within poorly monitored, disorganized, or highly distracting environments, thereby missing vital opportunities for modeling and scaffolding (Rosário et al., 2005). Empirical research conducted in Eastern Europe by Šimeg (2020) paints a concerning picture: data on fourth-grade primary school students show that 60% complete their homework and home reading 'at the last minute', while 40% admit to regularly resorting to plagiarism or copying to evade academic scrutiny. This prevailing landscape of disengagement and dependency calls into direct question the purpose and structural quality of

tasks currently designed by teachers, underscoring the ethical urgency of addressing the 'homework gap'. Unless calibrated through criteria of inclusivity, differentiation, and personalisation, homework risks functioning as a magnifier of social inequality, rewarding students with supportive home environments while systematically penalizing those facing socio-economic or linguistic disadvantage.

Consequently, effective instructional design must incorporate principles of sustainability and developmental appropriateness. Empirical evidence from Hattie's (2009) seminal meta-analysis (*Visible Learning*) provides crucial data to inform instructional decision, demonstrating that homework efficacy is heavily mediated by students' age and neurocognitive development. At the primary school level, data reveal an exceptionally low overall effect size (d=0.15), well below the benchmark of pedagogical hinge-point significance (d=0.40). This indicates that younger children, who lack fully established self-regulation and distraction-inhibition mechanisms, derive negligible benefit from traditional homework loads. Indeed, such burdens risk engendering frustration, learned helplessness, and premature academic disengagement.

Therefore, instructional design for this age group pivot towards brief, targeted, and playful activities, or tasks strictly focused on the scaffolded reinforcement of foundational skills. In contrast, at secondary school level, the impact increases significantly to an effect size of d=0.64. At this stage, the maturation of autonomy and time-management skills enables teachers to set complex tasks aimed at analysis, synthesis, and independent inquiry. To prevent cognitive overload and safeguard student well-being, the literature advocates

the well-known ‘10-minute rule’ (Cooper et al., 2006) as a benchmark design criterion: a maximum daily homework load of 10 minutes per school year level (e.g. a cap of 30 minutes for a Year 3 primary class).

1.3. School Policies, International Comparative Models, and Interactional Frameworks

Institutional responses to this complex phenomenon vary widely worldwide, oscillating between top-down legislative abolition and local autonomy delegated to teacher reflexivity. The Finnish model relies on complete professional autonomy for teachers regarding methods and activities; homework is non-mandatory and occupies minimal time. The underlying philosophy holds that active work completed during school hours is entirely sufficient, and that excessive home tasks risk overloading students, thereby infringing upon their constitutional right to rest, sport, and spontaneous socialisation. In sharp contrast to Eastern European traditions, Poland’s 2024 legislative reform saw the government formally restrict primary school homework. The state fully abolished home assignments for Key Stage 1 (The first cycle, years 1-3), except for tasks strictly dedicated to fine motor skills, such as handwriting. For subsequent year groups (Years 4-8), assignments remain strictly optional; students are under no legal obligation to complete them, nor can they be penalized with poor grades (Nolan, 2024).

The Scottish and Irish models present alternative frameworks grounded in flexibility and delegation to individual schools. In Ireland, where the Department of Education refrains from issuing quantitative guidelines, the Children’s School Lives (2024) longitudinal study of 4,000 primary school students highlights a contrasting trend: students’ attitudes towards homework become markedly negative between Year 4 and Year 5 (ages 9-11), whereas

parents maintain a highly positive stance, interpreting homework as a mechanism for school quality control. To bridge this perceptual gap, certain schools have adopted flexible practices. For instance, at Gaelscoil Mhíchíl in West Cork, traditional homework is suspended for an entire month each year and replaced with a 'good deed' or kindness journal (O'Connor, 2019). On Fridays, children share messages placed in a 'kindness basket', shifting the design focus from repetitive drills to socio-emotional learning and prosocial behaviour, though full obligation is reintroduced in the final year as a rite of passage and formal preparation for secondary education.

Furthermore, the Croatian and Slovenian contexts offer deeper insights into student perceptions. Research by Ivić (2017) focusing on learner perceptions among 963 fourth and seventh grade students in Croatia shows that while over half the sample recognizes homework's abstract educational value, approximately 30% find it unengaging and nearly 50% explicitly call for its abolition. Notably, the study demonstrates a statistically significant age gap: fourth graders perceive homework as more engaging and useful than their older peers in seventh grade, leading researchers to advocate for the active involvement of students in co-designing workloads and task formats.

In contrast to this substantial body of empirical literature relying predominantly on self-report instruments, such as interviews, focus groups, and questionnaires, educational research has historically neglected the ecological analysis of homework within its naturalistic setting. Observational studies tracking spontaneous verbal interactions remain rare yet crucial. Within this interactionist tradition, cross-cultural research (e.g. Kremer-Sadlik et al., 2010) demonstrates how family discursive practices reflect specific cultural models of socialisation. While American parents tend to adopt a 'teacher-like evaluative gaze' imposing high performance standards, Italian parents display more

ambivalent stances, frequently negotiating or questioning the legitimacy of school demands. Despite these variations, empirical evidence confirms that parents actively co-construct the ethical priority of homework, acting as institutional proxies that mirror the moral framework and interactive formats typical of formal schooling.

Within this framework, the adult's role oscillates precariously between supportive scaffolding and over-engagement. Driven by a desire to facilitate task completion, parents frequently expropriate the child's learning tasks, thereby curtailing their creativity and problem-solving resourcefulness. Classic parenting guidance (Canter & Hausner, 1987; Cooper et al., 2006) advocates transitioning from an initial role of organizer and motivator to light monitoring, leaving the student to work independently unless assistance is explicitly requested. In the early primary years parental support should focus on environmental adaption and structuring time-space routines; however, it must gradually fade out to prevent adults from substituting the teacher (Di Pietro, 2009; Montalbetti & Lisimberti, 2020; Caronia & Colla, 2024), an intrusive interference that directly impedes the student's development of self-regulation and autonomy.

The dynamic illustrates how a teacher's micro-instructional choices condition the quality of home interaction, indirectly shaping the household's relational climate. Recent literature (Lazzarich, 2022; Petek, 2012; Senekovič, 2007) converges on the view that homework should not necessary be abolished, but radically re-conceptualised functionally within macro-instructional design. It finds pedagogical justification only when expanding learning opportunities through challenging, active tasks (Bodgan, 2018; Šimeg, 2020), moving beyond

the standardized ‘one-size-fits-all’ model towards a reflective design framework that leverages different methodologies, such as project-based learning or portfolio documentation.

Reflecting on these methodological challenges, empirical surveys across compulsory education provide a clear picture of how teachers translate homework into daily practice, revealing a persistent gap between theoretical literature and classroom reality. In a mixed-methods study by Avci et al. (2025), a strong reliance on daily assignments emerges, practiced by 68% of surveyed teachers. This is driven by a deep-rooted belief, shared by 60% of the sample, that consistent drill highly benefits student progress. However, analysis of instructional aims reveals sharp polarization: 51% of teachers align homework design merely with consolidating classroom content, whereas considerably smaller proportions intentionally plan extracurricular tasks to cultivate student autonomy (25%) or a sense of personal responsibility (20%).

A pivotal dimension of instructional design lies in the classroom review and correction phase, conceptualized as a formative assessment tool. Homework efficacy depends on specific contextual and instructional conditions (Vidović et al., 2014), including explicit alignment with classroom learning to foster deep processing, task sustainability and brevity to ensure an independent experience of mastery, collaborative negotiation of rules with students, and the provision of regular, descriptive feedback. Empirical data indicate that teachers tend to favor flexible, mixed review strategies (34%) or collective reading and discussion of tasks (30%), whereas purely written, individualized correction stands at 25% (Avci et al., 2025). Of particular pedagogical concern are the structural constraints reported by practitioners themselves: while 38% of teachers identify the primary limitation as a lack of student time, 20%

acknowledge an internal conflict tied to their professional role, specifically, the lack of dedicates time to track, evaluate, and return timely, actionable feedback on assigned tasks.

In conclusion, reflecting on full-day school models forces a re-evaluation of the pedagogical value of out-of-school time and space, leveraging the absence of direct adult supervision. When an open, flexible instructional design guides a child to explore learning topics independently, through open-ended tasks, heuristic research prompts, or unstructured resources, pupils develop genuine self-awareness and self-efficacy. Conversely over-controlling daily tasks and relying on mechanical reproduction risks fostering insecurity and emotional vulnerability (Seligman, 2011).

Thus, scientific literature underscores the imperative for a paradigm shift in teachers' design practices: homework must break free from bureaucratic routines and repetitive worksheets to be fully integrated into intentional instructional planning. It should constitute a deliberate space-time framework aimed at transferring agency and learning responsibility directly to the student, thereby nurturing a genuine of lifelong autonomous learning.

2. The Theoretical Inversion: Dialogic Teaching Applied to Homework Design

To resolve the theoretical stalemate that reduces homework to a mere time variable or a purely domestic factor, this paper proposes embedding Alexander's (2006; 2020) seminal *Dialogic Teaching* framework into instructional design. Dialogic teaching rests on the premise that talk serves as the primary cognitive vehicle through which a learning community. Alexander sharpy distinguishes dialogic discourse from traditional classroom verbal

interaction, which is historically dominated by the teacher through rigid Initiation-Response-Feedback (IRF) exchanges and characterised by brief, fragmented, and purely reproductive responses from learners.

Hitherto, both Alexander and subsequent international literature have applied dialogic criteria and communicative repertoires almost exclusively to immediate, real-time verbal interaction within classroom walls (*Classroom Talk).* The core epistemological and methodological contribution of this paper lies in executing a subtle yet crucial theoretical inversion: demonstrating that the dialogic richness of classroom discussion does not emerge spontaneously when the teacher initiates debate, but is prefigured, scaffolded, and structurally embedded within the homework task itself.

Within this inverted framework, homework ceases to be conceptualised as a pause or suspension of instructional dialogue; rather, it becomes its primary engine, the sematic trigger that fuels the reflective quality of subsequent classroom discourse. Extending instructional action into the extracurricular space is no longer a blind delegation to the family, but an intentional act of micro-design aimed at generating 'cognitive artefacts', productive doubts, and heuristic experiences. Students bring these back to the classroom, providing the essential empirical and conceptual material upon which a genuine dialogic architecture can be constructed.

3. Research Objectives and Questions

The primary objective of this study is to formalise and exploratorily describe the Task-Mediated Design Episode (TMDE) as a heuristic and analytical tool for observing dialogic interaction in Primary School Classrooms. Given that the TMDE framework and its associated coding system represent an initial operational proposal, this research does not aim to provide a formal

psychometric validation or establish causal relationships. Instead, it seeks to explore how upstream choices in homework design correspond to observable variations in downstream turn-taking structures, verbal repertoires, and the density of conceptual relationships during classroom discussions.

To address this exploratory focus, the study is guided by three descriptive research questions:

RQ1 (Qualitative and Category Mapping): how does the operational categories of homework (traditionally-closed vs. dialogically-oriented) map onto the observed occurrence of Alexander's five Dialogic Teaching Criteria (Collective, Reciprocal, Supportive, Cumulative, Purposeful) during review session?

RQ2 (Exploratory Sequential Patterns): what sequential turn-taking patterns and transition probabilities (e.g. from I-R-E recitation scripts to extended chains of exchange) can be observed depending on the type of task previously undertaken by students?

RQ3 (Network Configuration Mapping): how do the observed configurations of epistemic networks and their semantic centroids vary when discussion is mediated by a task designed as an autonomous heuristic artefact compared to conventional worksheets?

4. Research Theoretical and Analytical Definition of the TMDE considering Alexander's Repertoires

The empirical corpus for this exploratory study was collected across 12 primary school classrooms, involving 12 teachers and 240 pupils (N = 240). The data collection yielded 36 hours audio recordings, resulting in a *verbatim* transcribed corpus of around 135,000 words. This sample size was selected to balance qualitative depth with empirical robustness within a micro-analytical

framework. The volume of transcribed text and the overall recording duration ensure theoretical saturation of the emerging dialogic patterns, while the bounded educational context allows for a high-fidelity, ecologically valid examination of classroom interaction and pedagogical mediation. To establish a rigorous scientific foundation for this research, the Task-Mediated Design Episode (TMDE) is theorised and defined neither as an isolated slice of school time (i.e. homework correction) nor as the tangible artefact itself. Instead, it constitutes a trans-spatial, process-oriented, multi-code unit of analysis that functions as a semantic mediator and activator of the interactional and communicative repertoires described in Alexander's framework.

The TMDE disrupt the fragmented view of instructional time by linking three distinct macro-phases across different spatial-temporal domains into an inseparable continuum that governs the structure and selection of talk formats within the classroom matrix:

1.The Design Input (PRE-School Space): this space entails the analysis of the task assignment formulated by the teacher (the written prompt or instructions on the digital platform). It represents the repository of the teacher's pedagogical intentionality, where downstream Interactive Settings are pre-selected, determining whether the home task will feed into whole-class teaching, student-led group work, or paired interaction. Dialogic intentionality manifests in the Questioning structures embedded within the prompt: the teacher bypasses traditional test questions geared towards rote recall, structuring assignment around authentic open-ended questions with high heuristic potential.

2.The Independent Experience (INTER-Home Space): Taking place in the extracurricular, domestic context without direct supervision, this phasis re-signified as a protected space where the student independently enacts Talk

repertoires. Away from synchronous peer pressure, the student is prompted to produce a conceptual or material 'artefact' that requires them to explain, speculate, imagine, analyse, and justify their findings. The conditions cultivated at home foster inner listening, extended thinking time (wait-time), and critical reflection on alternative viewpoints emerging from independent exploration.

3.The discursive Co-construction (POST-School Space): this phase unfolds via *verbatim* verbale interactions during the collective review session in the classroom. It serves as the arena where domestic findings activate Teaching Talk and Everyday Talk. Homework ceases to be the object of a purely transmissive monologue or rote recitation; instead, it becomes the generative core of a complex classroom transition towards high-quality discussion and dialogue.

In terms of statistical and computational modelling, the TMDE serve as a structural mechanism that guides and constrains conversational stochasticity. It functions as the primary independent variable capable of significantly altering transition probabilities among classroom conversational codes: the epistemological quality underlying classroom interaction ultimately the depth of learning, requiring students to construct thought rather than merely report the thoughts of others (Nystrand et al., 1997).

4.1. Methodological Framework and Analytical Techniques: The Unified Matrix Based on Alexander's Framework

To enable a trans-spatial analysis of the TMDE device, this study employs a mixed-methods, multilevel research design that integrates qualitative content analysis with advanced computational Learning Analytic, characteristic of Quantitative Ethnography (Shaffer, 2017). The dataset encompasses

documentary records of assigned tasks, physical and written artifacts produced by students, and *verbatim* transcriptions of oral classroom review and discussion sessions.

The empirical identification of the TMDE within the continuous flow of classroom transcripts is guided by a systematic observational rule. The episode formally opens at turn (T_n), marked by an activation vector, defined as a verbal marker or deistic used by teacher or a student that explicitly anchors the discourse to the homework assignment. It spans all subsequent turns (T_{n+x}) in which the artifact or experience is manipulated, discussed, and problematised by the class, and concludes at turn (T_m) where the focus on the task dissolves, signaling either a transition to an unrelated activity or the institutional formalization of knowledge.

Coding Example and Classroom Transcription

The following illustrative excerpts demonstrate the exploratory coding scheme

Adapted from Alexander's (2006; 2020) framework, applied across two distinct task conditions:

Fragment 1: Traditionally Oriented TMDE (Closed Grammar Worksheet)

- **Turn 1 (Teacher):** «Alright, let's take out the grammar analysis worksheet we had for today. Matteo, let's start with you: what is the word 'splendidly' in the first sentence?»

  [Coding: COMP_CHI; TALK_RECITATION, TEST_QUESTION]

- **Turn 2 (Matteo):** «It's a qualifying adjective... no, an adverb».

  [Coding: COMP_CHI; EXPLAIN]

- **Turn 3 (Teacher):** «An adverb, exactly, well done. Remember the rule. Sofia, move on to the second word, 'were running'».

  [Coding: COMP_CHI; EVALUATIVE_FEEDBACK]

Fragment 2: Dialogic Oriented TMDE (Open Assignment: «Find an irregular object at home that can form an interlocking fit»)

- **Turn 24 (Teacher):** «Sofia has placed on the table the artifact she tracked down yesterday afternoon at home. Let's look at it together. What surprises you about its geometric shape?»

  [Coding: COMP_DIA; AUTHENTIC_QUESTION; CRIT_COLL]

- **Turn 25 (Student A):** «Teacher, it has no straight edges, it looks like a twisted piece of bark, it's not a flat shape».

  [Coding: COMP_DIA; SPECULATE; CRIT_REC]

- **Turn 26 (Student B):** «But if you turn it around and bring it close to the stone Matteo brought, look... the profiles fit together perfectly even though they are both irregular!»

  [Coding: COMP_DIA; ANALYSE; MOVE_ADD; CRIT_CUM]

- **Turn 27 (Teacher):** «This is an extraordinary juncture. How do you explain the fact that two such asymmetrical shapes can produce a perfect fit? Who wants to add a piece or challenge this thesis?»

  [Coding: COMP_DIA; MOVE_SEV; MOVE_EVI; CRIT_FIN]

4.2. The Temporal Dimension: Lag Sequential Analysis (LSA)

Coded data are analysed via Lag Sequential Analysis (LSA) (Bakeman & Quera, 2011) to examine whether the introduction of a dialogic task alters turn-taking stochasticity. This is achieved by calculating the conditional probability that a 'target code' succeeds a 'criterion code' at a specified distance (lag), evaluated using the adjusted *z-score*:

$$P(j_{t+1}|i_t) = \frac{f(i_t, j_{t+1})}{f(i_t)} \qquad z = \frac{f(i_t, j_{t+1}) - E(i_t, j_{t+1})}{\sqrt{V(i_t, j_{t+1})}}$$

Applying LSA to the corpus revealed the following significant probabilistic patterns ($p < .05$):

In the Traditional sub-model (COMP_CHI): The transition shows a tight probabilistic loop dominated by the Rote/Recitation format. The criterion code Teacher poses question is followed at Lag 1 by 'Student response' with a 92% probability (z = 4.87); at Lag 2, 'Teacher evaluative feedback' systematically appears with an 88% probability (z=5.12). This highly predictable, linear, and cyclical structure documents the closure of the classroom's reflective potential.

In the Dialogic sub-model (COMP_DIA): A rupture of the I-R-E script is recorded. The criterion code 'Student introduces home artifact' is followed at Lag 1 by the appearance of 'Learning Talk' codes (*Speculate, Argue, Justify*) or the cumulativity criterion (CRIT_CUM) with a 64% probability (z=3.21). At Lag 2 and Lag 3, horizontal extension moves (MOVE_ADD or MOVE_EVI) appear with significant frequency at probabilities of 42% (z=2.98) and 38% (z=2.65), respectively. This mathematically proves that the open task form expands and extends the verbal chain of exchange.

4.3. The Spatial Dimension: Epistemic Network Analysis (ENA)

To model how different dimensions of classroom talk connect with one another during review sessions, Epistemic Network Analysis (ENA) (Shaffer et al., 2016) can be utilized as an exploratory visualization tool. ENA is particularly useful in quantitative ethnography because it allows researchers to construct network structures based on the co-occurrence of codes within a moving conversational window (e.g., across consecutive turns of talk). Rather than focusing on isolated code frequencies, ENA serves to map the geometric architecture of discourse, illustrating which pedagogical criteria, question types, and student moves tend to operate together.

Within this exploratory framework, ENA can be applied to compare the interactional configurations that emerge under different task conditions:

- Conventional Task Configurations (COMP_CHI): Network modeling can help examine the extent to which traditional worksheets associate primarly with a narrow axis of closed teacher questions and evaluative feedback, potentially showing whether student initiative and peer reciprocity remain peripheral or disconnected.
- Dialogic Task Configurations (COMP_DIA): Conversely, ENA allows for mapping whether open-ended or artifact-mediated tasks cluster with higher relational density around criteria such as reciprocity, cumulative reasoning, and argumentative extension.

By projecting these discourse structures into a shared network space, ENA provides a heuristic means to visualize potential shifts in the classroom's sematic center of gravity. Interpreted strictly as a descriptive and exploratory

technique, this approach offers a framework for examining how upstream instructional design choices may correspond to more distributed or student-centered patterns of classroom interaction.

5. Subsequent Steps: The integration of Artificial Intelligence (AI) into the TMDE

The formalisation of the TMDE as a dialogic, processual, and trans-spatial device engenders scientifically relevant scenarios when interfaced with emerging Generative Artificial Intelligence (AI) technologies. In contemporary primary schools, AI should not be regarded as a substitute for teaching practice or to expedite the mechanical completion of schoolwork, a phenomenon that has been identified as a catalyst for plagiarism (Šimeg, 2020). Instead, it should be configured as a co-designer of dialogic artifacts and a reflective mediator capable of enhancing the TMDE's ecological continuum.

6.Discussion of Results and Conclusions: Towards an Ecology of Dialogic Homework

The theoretical and methodological framework proposed in this paper offers innovative perspectives for the pedagogical debate on primary school homework, moving beyond the conventional ideological dichotomy between homework proponents and detractors. By conceptualizing the Task-Mediated Design Episode (TMDE) through the integration of Lag Sequential Analysis and Epistemic Network Analysis, this exploratory contribution highlights how the structure and design of homework can operate as a meaningful structural constraint, capable of shaping and guiding the architecture of classroom talk the following morning. The cognitive and interactional effectiveness of

homework review is not a linear function of time spent (*time-on-task*); rather, it is closely tied to the epistemological geometry of the TMDE designed by the teacher upstream.

Conventional, closed-structured homework assignments (COMP_CHI) often present a fundamental pedagogical limitation: they risk assignments (COMP_CHI) often present a fundamental pedagogical limitation: they risk fostering cognitive isolation in the domestic environment and perpetuating the reproduction of the traditional I-R-E script and recitation format within the classroom. This approach tends to reduce the review phase to a procedural or bureaucratic check, limiting opportunities for student initiative and autonomy. Conversely, framing homework through a dialogically oriented TMDE (COMP_DIA) illustrates how open prompts, heuristic inquiries, or independent tasks can serve as generative triggers for high-density cognitive talk.

In this context, classroom interaction can shift toward social constructivism, providing a structured space where Alexander's guiding criteria (collectivity, reciprocity, supportiveness, cumulativity, and purposefulness) can be meaningfully explored. Rather than producing fragmented or premature responses, open-ended tasks encourage substantial contributions and create opportunities for formative feedback that moves thinking forward. The outcome of out-of-school activity thus generates new questions, inviting students to engage in reflective inquiry within the classroom's dialogic flow.

As this represents an ongoing research project, the empirical analysis is revealing new emerging coding categories that go beyond the initial predefined framework. This iterative process allows for a deeper recontextualization of dialogic analysis, emphasizing the need to adapt analytical frameworks to the specific school context and educational setting under study. Framed as a conceptual and exploratory model, the TMDE offers a flexible heuristic tool for

teachers seeking to design extracurricular learning in continuity with classroom practice, as well as for researchers interested in mapping the sequential and spatial dynamics of educational talk. Moving toward high-quality, inclusive schooling requires liberating homework from its historical status as a mechanical routine. Instead, homework can be conceptualized as an intentional trans-spatial bridge designed to support student agency and self-regulation, fostering the development of a collaborative community of inquiry.

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