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Absent Partners – Artificial Allies

Conceptualizing genAI as Collaborative Actor in Educational Design Research

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Abstract
Collaboration between researchers and practitioners is central to Educational Design Research (EDR). However, epistemic-temporal misalignments as well as power-dependency relations frequently impede such collaboration, particularly in projects addressing technology-rich educational contexts. This paper examines these collaboration challenges as a constitutive part of EDR rather than as contingent implementation problems. Drawing on Actor-Network Theory (ANT), the paper reconceptualises collaboration as an emergent effect of socio-material networks where technologies are not treated as neutral tools but as actors. Against this backdrop, it explores how generative artificial intelligence (genAI) might strengthen research-practice interactions by assuming specific collaborative functions in situations where human participation is constrained or unevenly resourced. Through two constructed scenarios situated in school contexts, the paper illustrates how genAI could formalise tacit knowledge or provisionally represent absent stakeholders within EDR networks. Rather than positioning genAI as a substitute for human collaboration, the paper argues that genAI-enhanced collaboration may contribute to the stabilisation and extension of collaborative relations within EDR networks. In doing so, it advances a theoretically grounded and methodologically transferable perspective on AI integration in EDR – one that treats the design of human-AI collaboration as a scholarly decision worthy of explicit documentation and critical scrutiny, rather than an ad hoc response to resource constraints.

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Abwesende Partner – Künstliche Verbündete. Konzeptualisierung von genKI als kollaborativer Akteur in Educational Design Research

Zusammenfassung
Kollaboration zwischen Forschenden und Praktiker:innen nimmt im Educational Design Research (EDR) eine zentrale Stellung ein. Epistemisch-zeitliche Diskrepanzen sowie Machtasymmetrien erschweren die Kollaboration jedoch häufig, besonders in Projekten zu digitalen Bildungskontexten. Der vorliegende Beitrag begreift diese Herausforderungen nicht als kontingente Implementierungsprobleme, sondern als konstitutiven Bestandteil von EDR. Unter Rückgriff auf die Akteur-Netzwerk-Theorie (ANT) wird Kollaboration als emergenter Effekt sozio-materieller Netzwerke konzeptualisiert, in denen Technologien nicht als neutrale Werkzeuge, sondern als Akteure in Erscheinung treten. Vor diesem Hintergrund wird erörtert, inwiefern generative Künstliche Intelligenz (genKI) das Zusammenspiel zwischen Forschung und Praxis stärken könnte, indem sie in Situationen eingeschränkter oder ungleich verteilter menschlicher Beteiligung spezifische kollaborative Funktionen übernimmt. Anhand zweier konstruierter Szenarien prototypischer Kollaborationsprobleme im schulischen Umfeld zeigt der Beitrag, wie genKI bestehende Forschungs-Praxis-Interaktionen z. B. durch die Formalisierung impliziten Wissens oder durch KI-generierte Platzhalter nicht präsenter Akteure erweitern könnte. Dabei wird genKI nicht als Ersatz menschlicher Zusammenarbeit verstanden, vielmehr wird argumentiert, dass genKI-gestützte Kollaboration zur Stabilisierung und Ausweitung kollaborativer Beziehungen in EDR-Netzwerken beitragen kann. Der Beitrag entwickelt damit eine theoretisch fundierte und methodologisch übertragbare Perspektive auf KI-Integration in EDR – eine Perspektive, die die Gestaltung menschlich-maschineller Kollaboration als forschungspraktische Entscheidung begreift, die expliziter Dokumentation und kritischer Reflexion bedarf, anstatt sie als Ad-hoc-Reaktion auf Ressourcenengpässe zu behandeln.

1. Introduction

Educational Design Research (EDR) has been widely recognised as well suited to the design and iterative refinement of technology-rich learning environments as it enables a close integration of theoretical considerations and practical design work (Minichiello and Caldwell 2021; Reeves 2006). However, the collaborative foundation upon which EDR rests remains fragile. Epistemic and temporal misalignments (e.g. research knowledge vs. actionable knowledge; school year cycle vs. research cycles) between researchers and practitioners, compounded by power-dependent relations (e.g. gatekeeping), frequently impede sustained research-practice interaction (Euler 2024; Grunau and Gössling 2020).

Against this background, the emergence of *generative artificial intelligence* (genAI) with its human-like actions, outputs and imperfections raises a question that is both pragmatic and conceptual: *How might genAI strengthen research-practice interactions by supporting the stabilisation of collaborative relations within established EDR frameworks?*

Rather than positioning genAI as a replacement for human collaboration, this paper explores whether genAI might address collaboration challenges by functioning as an actor within EDR networks (Gutiérrez 2024; Röhl 2026). To this end, *Actor-Network Theory* (ANT; Latour 2005) is employed as an analytical lens, reconceptualising collaboration not as a given interpersonal relation but as an emergent effect of socio-material networks where technologies are not treated as neutral tools.

This paper contributes to educational research, and to the discourse on EDR in school contexts in particular, in two ways. First, it conceptualises collaboration challenges as constitutive elements of EDR. Second, it uses ANT to investigate the potential role of genAI as a collaborator in EDR, discussing associated theoretical, methodological and ethical implications. To illustrate this argument, two constructed scenarios of prototypical collaboration challenges are developed as theoretically grounded thought experiments.

2. Collaboration in Educational Design Research

Following Bakker (2018), EDR is understood as a methodological framework that develops innovations to solve educational problems while simultaneously generating scientific knowledge about educational processes. EDR is characterised by diverse conceptualisations (Reinmann 2022), yet consistently combines design and research through an iterative, theory-based, collaborative process that actively intervenes in practice whilst remaining responsive to emerging challenges (Bakker 2018; McKenney and Reeves 2019). Collaboration is EDR's constitutive feature. Whilst iteration alone cannot justify EDR (Kerres 2022), the ambition to address educational problems through targeted intervention necessitates iterative processes whose success depends fundamentally on effective researcher-practitioner collaboration.

2.1 Collaboration as Constitutive Element of EDR

EDR conceptualises collaboration not as a peripheral activity or as designing for practitioners, but as an epistemic and methodological foundation that shapes research across all phases (see Fig. 1). The term *collaboration* is used here as an umbrella concept for related notions such as cooperation or co-construction. Its use reflects that joint work in EDR is rarely stable but continuously reconfigured across phases, actors and contexts (Beyer et al. 2024). Research is thus framed as a collective process in which scientific knowledge and practical experience are continuously negotiated and transformed (Euler 2024; Kerres 2022).

Collaboration among diverse actors enables the integration of multiple perspectives and supports a more responsive form of research that takes practitioners' needs seriously (McKenney and Reeves 2019). Euler (2024) emphasises that the systematic involvement of experienced practitioners provides access to situated experiential knowledge, thereby improving both the quality of interventions and the theories derived from them. This dual orientation reflects EDR's ambition to bridge research and practice without privileging one domain over the other (Euler 2024).

At the same time, such collaboration is inherently demanding, as it brings together actors with differing interests and institutional logics (Kerres et al. 2022). Communication therefore requires openness on both sides: practitioners need to engage with scientific perspectives, while researchers must be willing to integrate practice-based experience into their conceptual frameworks (Kerres et al. 2022). In this sense, collaboration can be understood as a positive-sum game in which experts from different domains, pursuing complementary interests, generate mutual benefit (Dilger and Euler 2017).

However, the potential of collaboration cannot be assumed a priori. Kerres et al. (2022) point out that collaboration in EDR rests on a fragile foundation, as described differences must first be made explicit and negotiated. They identify key features of collaborative practice: a shared view on an educational problem, recognition of scientific research and educational practice as legitimate sources of knowledge, project-based organisation with clearly defined scopes of collaboration, and the deliberate development of methods that explicitly address collaboration and potential conflicts. Euler (2024) arrives at similar principles and highlights their importance as orientation points for managing collaborations.

Dilger and Euler's (2017) continuum of practitioner roles adds a further analytical perspective, which conceptualises participation as varying in intensity from intensive collaboration, where practitioners act as co-producers or reflective partners, through active participation to peripheral affiliation, where their involvement remains instrumental. This role-based perspective complements phase-oriented accounts of collaboration in EDR. Each phase requires explicit agreements on roles and formats and the intensity and epistemic significance of their involvement vary accordingly (Euler 2024). Taken together, collaboration in EDR is thus a process in which roles and expectations are negotiated transparently and context-sensitively across phases.

2.2 Collaboration Challenges in School-related EDR Contexts

Collaboration challenges in EDR involve interrelated epistemic-temporal and power-dependency constellations (Euler 2024; Grunau and Gössling 2020) that can reduce design richness, limit iteration cycles, and create epistemic blind spots (Euler 2024). Epistemic tensions arise from differing orientations: practitioners prioritise actionable solutions, whilst researchers seek generalisable insights and theoretical coherence.

These reflect contrasting cognitive styles – pragmatic versus experimental reasoning – that complicate design alignment (Euler 2024). Temporal difficulties compound this: Differences in available time create friction between satisficing solutions and research demands for validation (Euler 2024). Epistemic and temporal misalignments thus reinforce one another, constraining collaborative exploration.

These misalignments are embedded in power-dependency relations. Practitioners' gatekeeping authority restricts experimental scope and limits researchers' ability to refine ambitious designs (Euler 2024). Unequal resource control creates dependencies affecting autonomy and therefore trust (one actor cannot get access to certain resources alone, e.g. headmasters gatekeeping access to schools or researcher gatekeeping access to experts). As collaborations evolve, interdependencies intensify, reducing flexibility and heightening vulnerability to misaligned expectations (Grunau and Gössling 2020). Benefits, trust and commitment fluctuate across cycles, destabilising collaboration (Euler 2024; Grunau and Gössling 2020). These dynamics challenge normative assumptions of symmetry and voluntariness in idealised EDR accounts.

When collaboration in school-related contexts is considered, these challenges take distinct forms. The organisational conditions structuring teacher work in schools shape the conditions under which any form of collaboration can occur. Epistemic and temporal misalignments are reinforced by organisational and professional cultures characterised by strong norms of autonomy and parity. Even when trust and shared goals emerge at the interpersonal level, organisational conditions (e.g. complex scheduling, lack of support from school administration) often constrain sustained and synchronised collaboration. Insufficient provision of dedicated time and space for joint work hinders interaction and the explicit articulation and negotiation of shared goals (Fussangel and Gräsel 2012). In addition, expectations of autonomous practice discourage intervention and critique, thereby limiting collaborative experimentation and iterative refinement (Fussangel and Gräsel 2012). In this respect, teacher collaboration reflects the general epistemic–temporal tensions of EDR, but in a form reinforced by entrenched work cultures.

These challenges become even more pronounced when children are considered as participants in EDR. Participatory research approaches, including EDR, tend to focus primarily on collaboration among adults/teachers. Learners, particularly children and students, are rarely included as active collaborators (Hüpping and Velten 2023; Lehrmann et al. 2022). This exclusion stems from institutional, epistemic, and ethical tensions. Conflicting logics reduce child participation to tokenistic student voice, whilst strong participation imperatives risk blurring boundaries and compromising rigour (Hüpping and Velten 2023). Underlying these tensions are normative assumptions about children's agency and persistent generational power asymmetries (Hüpping and Velten 2023).

Taken together, these interrelated challenges demonstrate that collaboration in EDR is shaped by structurally embedded tensions rather than isolated obstacles – tensions that additional human actors cannot dissolve. Consultants, facilitators or mediators

are embedded in the same temporal rhythms, resource scarcities, and institutional legitimation pressures that generate these asymmetries – and are therefore structurally positioned to reproduce rather than reconfigure them. Making these tensions explicit thus not only provides an analytical foundation for theorising, rather than idealising, collaboration as a constitutive condition of EDR (Euler 2024; Grunau and Gössling 2020), but also reframes the central question: not who else might collaborate, but what kinds of actors, operating outside these structurally produced constraints, could help to stabilise research-practice relations in EDR.

3. Actor-Network Theory

ANT provides a processual understanding of society as constituted by networks that emerge from the interplay of numerous human and non-human actors (Hohaus 2025). The approach emerged within Science and Technology Studies in the early 1980s, most prominently through the work of Callon, Latour and later Law (Akrich 2023; Callon and Latour 1981; Law 1992). It represents a radical reorientation of social constructivist thinking by questioning the assumption that social processes are shaped exclusively by human actors. Instead, technologies, artefacts, texts, guidelines, infrastructures etc. are treated as formative participants in the production and stabilisation of social order (Cresswell et al. 2010).

Rather than offering a unified explanatory theory, ANT is best understood as a reflexive research approach, an analytical position or a set of tools (Kneer 2009; Landri 2024). Its primary contribution lies not in causal explanation via abstract models, but in conceptual tools to trace how socio-material networks are formed, stabilised, transformed, or dissolved (Landri 2024; Schubert 2019). This entails a deliberate suspension of a priori distinctions, e.g. human versus non-human, social versus technical, or micro versus macro. ANT-based studies prioritise detailed empirical descriptions and micro-sociological analyses that follow actors across different sites and situations (Hohaus 2025).

Three core elements are central to ANT: *actor-network*, *symmetry* and *translation* (Hohaus 2025; Kneer 2009; Mifsud 2014).

3.1 Actor-Network

In ANT, an actor (or actant) refers to any entity that makes a difference within a network of relations (Belliger et al. 2013). Actors are not defined by intrinsic properties such as intentionality or consciousness, but by their capacity to participate in action as it unfolds in practice (Kneer 2009). Accordingly, actors include not only human individuals but also non-human entities (Latour 2005). From this perspective, social phenomena are not explained by reference to an underlying social context but are understood as effects of how heterogeneous relations are assembled in actor-networks (Belliger et al. 2013; Hohaus 2025; Mifsud 2014).

Actor-networks consist of mixed human and non-human associations that are simultaneously material and discursive (Kneer 2009). Actors may participate in multiple networks and assume different roles depending on their relational embedding (Schwarz et al. 2025). Agency is therefore distributed across the network rather than located in individuals. Technical artefacts, in particular, are not merely intentional tools used by humans but function as mediators that actively shape and transform social practices (Hohaus 2025; Kneer 2009; Latour 2005). ANT distinguishes such mediators from intermediaries: whereas intermediaries are assumed to transmit action unchanged, mediators translate and modify action as it passes through them, thereby influencing how networks stabilise or change.

Of the analytical constituents that specify how actor-networks operate (Mifsud 2014), *obligatory passage points* are most relevant here and refer to actors, artefacts or procedures through which other actors and relations must pass in order to achieve their goals. They channel and coordinate relations within the network, making them key sites of power and control.

3.2 Symmetry

Symmetry refers to ANT's methodological commitment to analysing human and non-human actors within the same analytical register. Rather than assuming that humans, social structures or intentions possess inherent explanatory priority, ANT adopts the principle of generalised symmetry, according to which all entities that make a difference in a network are treated analytically alike (Birkbak forthcoming; Kneer 2009; Mifsud 2014). This does not imply that humans and non-humans are identical or interchangeable, but that their respective capacities to act are not defined a priori (Landri 2024; Schwarz et al. 2025). Instead, agency is understood as a relational effect that emerges from socio-material configurations (Birkbak forthcoming).

By suspending dualisms, symmetry enables a post-deterministic perspective that avoids both technological determinism and social reductionism (Hohaus 2025; Kottmann 2002). Technical artefacts or digital systems are therefore neither neutral tools nor autonomous forces, but participants whose effects depend on how they are embedded in networks of relations (Belliger et al. 2013). At the same time, human actors are not treated as sovereign subjects but as entities whose action possibilities are shaped and constrained through their associations with non-human elements.

Methodologically, the principle of symmetry entails that descriptions do not switch explanatory vocabularies when moving between social and technical aspects of a phenomenon (Kneer 2009; Schulz-Schaeffer 2014). Human practices, artefacts, texts and technologies are analysed using the same descriptive language, allowing the researcher to trace how agency is distributed and how responsibilities, capacities, and effects are delegated across networks (Kneer 2009).

3.3 Translation

Translation describes the central dynamic through which actor-networks are formed, stabilised and reconfigured. Rather than conceiving action as the execution of predefined intentions, ANT understands translation as the process by which actors define problems, align interests, negotiate roles and establish connections between heterogeneous entities (Kneer 2009; Mifsud 2014). Through translation, actors and their relations are transformed: their goals and capacities to act are continuously redefined as networks are assembled (Hohaus 2025).

A common heuristic for analysing translation processes is provided by Callon's four interrelated moments (cf. Kneer 2009): *problematization*, *interessement*, *enrolment*, and *mobilisation*. *Problematization* refers to the articulation of a problem, and the construction of an obligatory passage point through which other actors must pass in order to participate. *Interessement* involves attempts to stabilise proposed relations by aligning actors' interests with the defined problem. *Enrolment* describes the negotiation and acceptance of roles within the network, while *mobilisation* concerns the extent to which spokespersons successfully represent and coordinate collectives. ANT emphasises that these moments are not sequential stages but analytical lenses that may overlap, repeat or fail (Hohaus 2025).

Translation is inherently transformative and contingent. It does not merely transmit meanings or actions but reshapes them as they move through networks. As a result, actor-networks remain fragile and reversible: alignments can weaken, spokespersons may be contested, and black boxes – temporarily stabilised configurations that conceal their internal complexity (Belliger et al. 2013) – can be reopened. Translation therefore draws attention to power not as a structural attribute, but as an effect of successful alignment and stabilisation within networks (Kneer 2009).

4. Conceptual Development

Building on ANT, this chapter conceptualises collaboration as a networked accomplishment and genAI as a potential collaborative actor. It then presents two scenarios, each derived from a distinct collaboration challenge (epistemic-temporal misalignment and the structural absence of a specific actor group), illustrating how genAI might address them by stabilising network relations. Specifying their actor constellations in advance would, within an empirical ANT study, sit uneasily with the injunction to follow the actors. The scenarios, however, are analytical thought experiments, not empirical reconstructions: here the deliberate specification of actors is constitutive rather than a departure from ANT, provided its provisional and constructed character is marked as chosen and not presented as given.

4.1 Collaboration as a Networked Accomplishment

From an ANT perspective, collaboration in EDR is not understood as a pre-given interpersonal relation between researchers and practitioners, but as an emergent effect of socio-material networks. EDR projects involve heterogeneous constellations of human and non-human actors. Collaboration arises insofar as these elements are successfully aligned and stabilised across iterative design and research activities (Kumar and Tissenbaum 2022). This network-oriented view aligns well with educational research, where ANT has been used to analyse learning and teaching as network effects rather than as individual achievements (Belliger et al. 2013; Hetland 2012) and to examine educational practices, infrastructures, and research-practice arrangements as socio-material networks (Hohaus 2025; Landri 2024; Mifsud 2014). Kumar and Tissenbaum (2022) emphasise that this applies in particular to EDR in technology-rich environments where researchers design technologies, test them within institutional constraints, and study them within networks.

From an ANT perspective, the above stated asymmetries in EDR collaboration do not exist a priori. Instead, they are understood as effects of uneven network stabilisation: certain associations between human and non-human actors become durably aligned, while others remain fragile or intermittent (Kneer 2009). Recurring patterns in EDR, such as limited practitioner involvement (Beyer et al. 2024), can thus be interpreted as outcomes of stabilised networks in which substitute arrangements take hold, while sustained research-practice collaboration remains difficult to maintain, rather than as deliberate choices or deficits of collaboration. This reconceptualization shifts analytical attention away from collaboration as a normative requirement and towards the socio-material conditions under which collaborative networks can be stabilised, extended, or reconfigured in practice.

4.2 Conceptualizing genAI as Collaborative Actor

The present paper focuses on dialogic genAI systems that operate through interactions with human actors. The scenarios developed below therefore assume AI systems whose contributions are shaped through goal-oriented prompting by human actors within the EDR network (Gutiérrez 2024; Röhl 2026), rather than autonomous AI agents acting independently of the network (Röhl 2026; Saqr et al. 2026; Seufert and Meier 2023).

Building on the reconceptualization of collaboration in Section 4.1, genAI can therefore be analysed as an actor that may participate in the stabilisation of EDR networks. In this context, ANT can help reveal and understand relational dynamics within AI-enhanced EDR networks as technologies are not treated as neutral tools but as mediators that transform practices and redistribute agency by taking on actions humans cannot perform in the same way or with the same continuity (Gutiérrez 2024; Kneer 2009 ; Latour 2005; Röhl 2026). This is especially relevant for genAI with its human-like actions, outputs

and imperfections, whose structural variability and novel mediatory properties are not captured by prior categories of technical artefact – a point recent ANT analyses treat as consequential (Gutiérrez 2024; Röhl 2026; Saqr et al. 2026).

When introduced into EDR settings, genAI does not simply add to existing collaborations but becomes entangled with researchers, practitioners, artefacts, and data practices, thereby contributing to network effects that reshape collaborative arrangements (Röhl 2026; Saqr et al. 2026). AI actors as network participants can therefore be contested or exploited by human actants, for positive and negative ends. Eventually, translation is achieved when all participants work towards a common goal (Gutiérrez 2024). Continuity across design phases and multiplicity of representations are thus relational accomplishments of human-AI configurations rather than intrinsic properties of the technology itself.

The collaboration challenges described in Section 2 are not incidental but structurally produced. This is what makes genAI analytically interesting as an actor. Because these challenges cannot be resolved by adding further participants – who operate under the same institutional logics and resource constraints – genAI matters not as a superior substitute but an actant occupying a position outside those conditions (Röhl 2026). It therefore does not resolve the challenges as such. What it may do is stabilise specific network relations – supporting the circulation of inscriptions, maintaining continuity across design phases, enabling the coexistence of multiple epistemic registers – precisely where sustained human participation remains fragile or uneven.

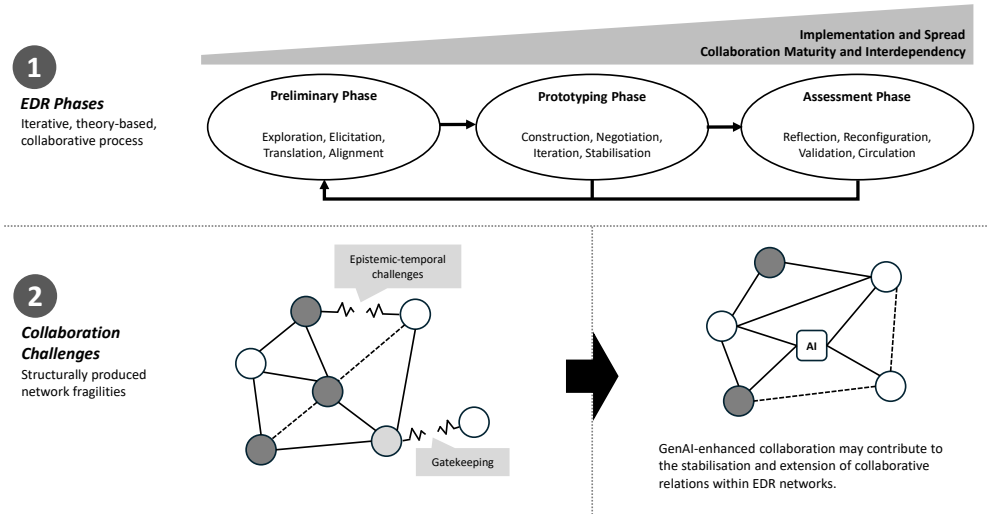


Fig. 1: Three-phase EDR process after Plomp (2013) with adapted maturity wedge after McKenney and Reeves (2019) (1); collaboration challenges within EDR networks and the proposed AI-enhanced EDR network under investigation (2).

4.3 Scenario 1 – Tacit-to-Formal Translator

The scenario is situated at the end of the preliminary phase of EDR (Fig. 1), in a project introducing a tablet-based collaborative writing environment in a secondary school. The actor network comprises teachers, researchers, students, educational technologies, institutional routines, and artefacts such as field notes, interview materials, and requirement documents. A central challenge concerns how tacit practice knowledge can be translated into formal representations that remain available and actionable across different phases of the EDR network.

Teachers' routines for managing devices, handling disruption, or responding to breakdowns operate largely at a tacit level and resist translation into research language (Toom 2022), whilst researchers require explicit requirements and design principles to proceed. This epistemic asymmetry is compounded by a structural one: thorough contextual elicitation – typically involving extended fieldwork or repeated interviews – demands researcher time that is rarely available. When contextual understanding remains thin, design decisions rest on partial representations of practice, generating artefacts that teachers later contest as insufficiently authentic. This fragility constitutes a foreseeable, structurally produced collaboration challenge.

To address this, genAI enters the network as a dual actor across two successive moments. In the first, it functions as interviewer (cf. Kupiec 2024). A researcher configures the genAI with contextual materials – field notes, institutional documentation, informal practitioner accounts – and a system-level prompt specifying the elicitation task. GenAI then conducts structured asynchronous conversations oriented around concrete micro-incidents – recent breakdowns, boundary cases, situations where habitual responses no longer applied. Structuring elicitation around exception cases, rather than asking teachers to abstract their routines directly (a task conflicting with the tacit character of the knowledge at stake; Toom 2022), establishes them as an obligatory passage point through which both practitioners and researchers must pass to produce knowledge that is simultaneously authentic and design-relevant. This reduces the researcher time required for initial elicitation without substituting the interpretive judgement that follows.

In the second moment, genAI functions as coder. Interview outputs serve as inputs to a prompting sequence oriented towards different representational registers: narrative accounts preserving teacher voice, operational design constraints, and candidate mechanisms with associated risk conditions. Since individual genAI outputs are path-dependent, multiplicity is achieved across distinct prompted interactions. A human actor assembles these into a layered artefact – an approach consistent with findings that AI-assisted qualitative analysis yields structured constructs comparable to manually developed systems when explicit methodological input is provided (Kempny et al. 2025). This claim is deliberately confined to qualitative content analysis, where categorising and systematising procedures lend themselves to structured AI support, and is not extended to other strands of qualitative research here.

The resulting inscriptions function as interessement devices aligning teachers, who recognise their lived practice in the narratives, and researchers, who formalise the derived constraints. Alignment is achieved not through interpretive consensus but through coexisting inscriptions addressing different epistemic requirements. Enrolment stabilises as constraint sets inform design decisions. Tensions surface when teachers contest perceived oversimplifications, particularly where routine actions are rendered as rule-like procedures failing to capture situational judgement; the prompting configuration is adjusted, producing hybrid inscriptions combining checklists with narrative vignettes. Stabilisation is maintained through iterative translation rather than closure. Overflows remain where aspects of practice are weakly inscribed, indicating where subsequent design work may encounter fragility.

4.4 Scenario 2 – Synthetic Proxy

The scenario is located at the transition from preliminary research to prototyping (Fig. 1), in a project developing a digital adaptive application for learning support targeting children with mathematical learning difficulties in mainstream primary schools. This group is explicitly addressed by the intervention yet logistically difficult to reach: such children are sparsely distributed across schools and subject to access constraints including parental consent processes and coordination with special educational needs coordinators. The challenge is how to proceed responsibly when direct access is constrained and costly to obtain – a structurally produced collaboration challenge that risks either design proceeding without valid grounding, or the network failing to stabilise at all.

Recent AI research suggests that domain-fine-tuned models can simulate responses at a fidelity supporting in silico prototyping (Binz et al. 2025), a logic that this scenario adapts to educational contexts. Building on this logic, and enabled by the increasing availability of open-source model architectures that can be fine-tuned locally on small, curated datasets (Corradini et al. 2025; Zhang et al. 2025), the constructed scenario involves a small language model (SLM) trained on empirical educational research on mathematical learning difficulties, practitioner knowledge from adjacent populations, accessibility and inclusion policies, and de-identified structurally related datasets. Unlike generic LLMs, whose training basis is vast but opaque and only incidentally relevant to this population, this SLM is fine-tuned on a controlled, domain-specific corpus whose boundary is known and documented. Fine-tuning does not remove the biases inherited from the base model, and the transparency concerns the training corpus rather than the model's internal workings. What it affords is the ability to evaluate outputs against an explicit knowledge base. The epistemic advantage therefore lies not in data volume but in this traceability of the corpus. This SLM enters the actor network as an actant generating synthetic data as a pragmatic translation device rather than an empirical substitute, enabling design work whilst keeping the target group's absence visible and revisable.

Actors collaboratively formulate the prompting configuration, specifying target group characteristics, the design task, and required output types. The SLM generates synthetic artefacts sequentially: personas first, then journey maps, then critical incidents. Each output is reviewed, labelled with its evidential basis or marked as an assumption, and submitted to governance inspection before use. The resulting evidence pack comprises personas as prototypical cases, journey maps foregrounding constraints experienced by children with mathematical learning difficulties, and critical incidents describing likely intervention failure points, each trace-linked to its source. Constraint-bound exception cases are foregrounded through the prompting structure, establishing a new obligatory passage point: meaningful design can proceed only by systematically articulating where standard solutions break down for this learner group.

The evidence pack functions as an interessement device aligning practitioners, who recognise classroom-plausible situations, researchers, who obtain candidate mechanisms, developers, who receive concrete test cases, and governance actors, who inspect assumptions for compliance. Enrolment stabilises around the provisional agreement to design for edge conditions now, with artefacts circulating as spokespersons for the absent group – explicitly marked as provisional and open to challenge. During prototyping, further prompted interactions yield synthetic interaction traces stress-testing design variants and revealing prototype fragility.

Controversies arise about representational validity: overflows are apparent where synthetic artefacts risk being treated as equivalent to lived experience, a risk amplified where specialised or embodied knowledge is required (Zeivots et al. 2025). The domain-specificity of the SLM partially mitigates this, as its training boundary is explicit and inspectable; however, bias towards populations and contexts represented in the underlying research remains a structural constraint. Governance actors accordingly tighten admissible claims, require explicit assumption registries, and enrol proxy experts to critique plausibility.

A further overflow concerns the provenance of the data itself. The corpus on which the SLM is trained consists of data produced about the target group by researchers, rather than data authorised or governed by the group itself. The synthetic proxy therefore speaks for an absent group based on externally produced representations – a concern that debates on data sovereignty have made explicit in insisting that those represented retain authority over data concerning them. This tension is particularly acute here: as minors with learning difficulties, these children are those whose self-authorised data production is constrained by the protective and consent requirements associated with research involving minors limited capacity to consent, so that the ideal of participant-governed data stands in tension with the imperative of protection. Research data nonetheless carry a legitimacy of their own, arising from a transparent and systematic process of generation. The point is therefore not that externally produced data are illegitimate,

but that they cannot substitute for the group's own voice – a tension that does not dissolve but is handled through compromise.

Safeguards grounded in ethical AI principles frame the process throughout: fairness, accountability, transparency, and explainability (FATE) (Mavrikis et al. 2021). Synthetic outputs are admissible only for plausibility checks, robustness testing, and risk screening, not for claims about effectiveness or learning outcomes. Once access to the children becomes possible, a targeted empirical evaluation cycle should confirm, revise, or reject design decisions informed by AI-generated translation. The preceding AI-supported process does not replace this access but directs it, ensuring that scarce and effortful contact with the target group is used where it matters most. This cycle is a non-negotiable condition of the process rather than an optional supplement.

5. Discussion

This paper examines whether, and under what conditions, genAI might strengthen collaboration within EDR, specifically in school settings. The analysis and presented scenarios focus on dialogic genAI systems whose contributions emerge through structured prompting and ongoing human guidance rather than autonomous actions (Saqr et al. 2026). This framing is consequential for all claims that follow: the collaborative effects attributed to genAI are relational properties of specific network configurations, not intrinsic capacities of the technology (Röhl 2026).

Viewed through ANT, the EDR collaboration challenges (Euler 2024; Grunau and Gössling 2020) can be reconstructed as effects of uneven network stabilisation rather than as individual failures of coordination. Accordingly, the scenarios employ the four moments of translation as a descriptive lens (Kneer 2009). Collaboration thus appears not as intentional alignment between human actors but as a relational achievement of networks in which artefacts and technical systems become consequential participants (Belliger et al. 2013; Latour 2005).

Across both scenarios, genAI emerges as an actant that does not replace translation but renders it more durable and more connectable. It does not, however, resolve persistent asymmetries in EDR. Where decision-making authority remains unevenly distributed, AI-supported translation risks stabilising apparent collaboration in which participation is enacted without substantially reshaping whose interests guide decisions (Dilger and Euler 2017; Lehrmann et al. 2022). In ANT terms, this constitutes incomplete enrolment. What the scenarios suggest, however, is that incomplete enrolment is not simply a failure condition. Both scenarios maintain the visibility of their own limits – through hybrid inscriptions that preserve teacher voice alongside formalised constraints, and through explicitly marked assumptions and planned empirical validation cycles. This deliberate *marking of boundaries* is what distinguishes productive from merely convenient stabilisation, and it represents a principle for AI-enhanced EDR that does not follow

automatically from the use of the technology but must be built into the workflow. A prior asymmetry nonetheless remains: both scenarios treat the enrolment of genAI itself as a premise rather than an object of negotiation. The scenarios foreground participants' contestation of individual outputs rather than their capacity to co-determine the configuration of genAI involvement as such. In ANT terms, enrolling a non-human actor is itself a contestable moment of translation.

The two scenarios differ in how this contribution is achieved. In the Tacit-to-Formal Translator scenario, the two-moment structure (interviewer, then coder) shows that genAI's contribution to network stabilisation is not uniform but varies with the collaboration challenge it tackles within the network. In the Synthetic Proxy scenario, genAI operates as a cautious translation bridge that lets design work proceed without obscuring the structural absence of specific actor groups. Empirical research on human-AI collaboration supports this conditional reading: genAI assistance tends to improve collaborative outputs without replacing the generative dynamics of human interaction, and its benefits are amplified when workflows preserve rather than substitute for human collaboration (Dai and van Swol 2026).

A recurring meta-level pattern is that network stabilisation is inseparable from selection and exclusion, which from an ANT perspective are not anomalies but constitutive features of translation. Human actors resist, renegotiate, and exploit genAI-mediated translations, and this contestation is not merely a stability risk but a methodologically productive re-translation (Gutiérrez 2024) that keeps network alignments revisable and normatively accountable – stabilisation and contestation are thus co-constitutive, not opposed (Kneer 2009). Stabilisation nonetheless privileges certain problem framings and inscriptions whilst marginalising others, and this exclusionary dynamic operates along at least two distinct axes in EDR. The first concerns participants who lack the critical AI literacy to contest AI-generated inscriptions effectively. While contemporary LLM interfaces lower the technical threshold for engagement, this accessibility is categorically distinct from the evaluative capacity required to interrogate inscriptions: lowering the threshold for use does not lower the threshold for critique. The second, analytically more significant, axis concerns practitioners who lack institutional access to EDR projects altogether – actors whose experiential knowledge is relevant to design, but who are excluded from research-practice networks before any question of genAI involvement arises. GenAI-enhanced EDR may open new participation pathways (e.g. asynchronous contribution or linguistic mediation) but cannot reconfigure exclusions that are institutionally produced upstream of the research process.

A further tension arises around the epistemic status of AI-generated inscriptions. ANT's principle of generalised symmetry holds that any entity capable of making a difference within a network qualifies as an actant, regardless of its internal constitution (Belliger et al. 2013; Kneer 2009). Applied to genAI, however, this analytical move can obscure a consequential distinction. GenAI outputs are statistically assembled artefacts

whose surface coherence and apparent authority may substantially outrun the evidential basis on which they rest. Gutiérrez (2024) has argued that generative models produce an impression of knowledge through pattern recognition rather than genuine understanding, and this matters for how their outputs are treated methodologically. A more productive framing, drawing on Röhl (2026) within a broadly Latourian sensibility, holds that genAI becomes analytically interesting as actants precisely because they fall short of human intelligence in a structurally revealing way. GenAI can synthesise and represent research material at a scale no individual researcher could match yet remain fundamentally constrained by the composition and representativeness of its training data. This constraint operates differently across model types. As set out for the SLM in Scenario 2, the transparency at stake concerns the documented training corpus rather than the model's internal operation, making critical scrutiny more tractable without rendering outputs bias-free.

For EDR, this suggests that AI-generated inscriptions need to be evaluated on two levels simultaneously. Within ANT, the relevant question is whether such artefacts stabilise enrolment and enable translation across the network. Beyond ANT, a separate epistemological scrutiny is required, asking what kinds of knowledge claims these artefacts are actually capable of supporting and what systematic biases or silences they may carry. The FATE principles offer one orientating framework for this second level of evaluation (e.g. Mavrikis et al. 2021). Their function, for example, in Section 4.4 is precisely to supply the normative accountability that ANT does not internally provide, particularly where AI-generated artefacts concern underrepresented or vulnerable groups. This suggests that *FATE-grounded safeguards* are not supplementary ethical add-ons but structurally necessary complements to ANT-based network analysis in EDR contexts. A related methodological risk, identified by Kempny et al. (2025), is what might be termed cognitive convenience, whereby the polished formulation of AI outputs encourages uncritical acceptance rather than the kind of engagement with ambivalence and contradiction that EDR data characteristically demand.

ANT is subject to specific limitations in this context that extend beyond its general scope as a sensitising framework. The epistemological and normative gaps noted above – its underspecification of genAI output properties (hallucination tendencies, prompt-sensitivity, training-data dependencies) and its silence on the judgements of educational quality and equity that are constitutive of EDR – are two such limits (Euler 2024; Gutiérrez 2024; Khan et al. 2024). A third is specific to genAI: ANT's emphasis on stabilisation sits in productive tension with the inherent variability of genAI outputs, suggesting that the black-boxing effects (Belliger et al. 2013) associated with stabilised networks may be more fragile and reversible in AI-enhanced EDR than the concept implies (Röhl 2026). These limitations do not disqualify ANT as an analytical lens. They specify the conditions under which its sensitising function must be supplemented by normative and epistemological resources that ANT does not itself supply.

A further boundary concerns the scope of the network traced here. The scenarios follow actors within the immediate research-practice setting and bracket the wider economic, infrastructural, and ecological relations in which genAI systems are embedded. From a consistent ANT perspective these are not external to the network but part of the actor-chains reaching into educational practice: the commercial design decisions of model providers, in particular, are mediations that become effective within participatory research whether or not they are made explicit. Bracketing them is an analytical delimitation appropriate to a methodological argument focused on collaboration, not a claim about their irrelevance or their normative neutrality. Tracing these extended chains – and scrutinising the mediations they introduce – is a necessary task for a critically oriented account of AI in EDR.

The scenarios developed in this paper indicate that systematic, phase-sensitive AI integration can be made analytically tractable and reproducible as a scholarly practice – if assumptions, boundaries, and validation conditions are explicitly inscribed rather than left implicit. In this sense, they may offer a transferable reference point for EDR projects that seek to treat AI integration as a methodological choice subject to the same reflective scrutiny as any other, and to make that choice visible in the published record.

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