CERN IdeaSquare Journal of Experimental Innovation, 2026; 10(2): 92-106
DOI: https://doi.org/10.23726/cij.2026.1859

ORIGINAL ARTICLE

When Freedom Is Structured: How Do Paradoxes Shape Co-Creation in Learning and Teaching?

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ABSTRACT

Co-Creation in Learning and Teaching is increasingly discussed as a form of educational innovation, promising to cultivate Future Skills and strengthen student agency. Yet empirical evidence from school contexts remains limited, particularly on how co-creation is experienced at a classroom-level. Drawing on paradox theory, this qualitative case study examines which tensions occur during co-creation in learning and teaching in a secondary Deeper Learning setting. It investigates how students and teachers experience these tensions, and how they describe navigating them. Interview data reveal interwoven paradoxical tensions spanning interactional, professional, curricular, and technological conditions. Three tensions proved especially salient: Structured Freedom, shifting teaching roles, and human–AI co-creation. These tensions functioned as activating conditions of co-creative learning, when they were kept in balance and approached with a both/and logic. The findings illuminate how Structured Freedom can operate as an organizing principle for enabling student co-creation, how students and teachers engage in co-creation at a classroom-level, how teacher roles shift and how ownership may have shaped AI use as support for students' own idea development.

Keywords: Whole-class co-creation in learning and teaching; co-creation; co-creative learning; student agency; adaptive teaching; human-AI co-creation; deeper learning; paradox theory.

Received: March 2026. Accepted: August 2026.

INTRODUCTION

Co-creation in learning and teaching refers to a collaborative and dialogic process in which participants integrate diverse knowledge, perspectives, and ideas, exercise influence over decisions, and jointly create meaningful outcomes. It is increasingly discussed as a promising approach to foster deeper engagement (Geurts et al., 2024; Jamil & Howard-Matthews, 2025; Sliwka & Klopsch, 2022). By encouraging creative action and collaborative inquiry, co-creation is furthermore considered beneficial for the development of future skills and transformative competencies, such as creating new value and taking responsibility (Beghetto, 2024; Ehlers, 2020; Geurts et al., 2024; Jamil & Howard-Matthews, 2025; OECD, 2020, 2024; Sterel et al., 2022). Co-creation has also been associated with strengthening student agency, enhanced ownership of learning, and experiences of self-efficacy, while enabling teaching and learning to respond more adequately to the diverse needs and strengths of contemporary learners (Beghetto & Karwowski, 2025; Bovill, 2020b; Cook-Sather, 2020a; Horlenko & Kaminskiene, 2022; Jamil & Howard-Matthews, 2025). In this sense, co-creation practices are seen as contributing to the broader aim of enabling learners to act meaningfully in and on the world (OECD, 2025).

While co-creation has shown promising potential in higher education contexts, it remains under-researched within school settings (Gandt et al., 2024b; Kaminskienė et al., 2020; Messiha et al., 2025; Omland et al., 2025). As Geurts et al. (2024, p. 107) note, only "few existing empirical studies" examine "how secondary students […] are involved in co-creation" within teaching and learning processes. Forms of co-creation that unfold within student teams and in interaction with accompanying teachers in classroom settings remain insufficiently understood and therefore constitute the focus of this study.

Although co-creation of learning and teaching is frequently associated with transformative potential, integrating co-creative practice into school contexts remains demanding (Bovill et al., 2015; Feichter, 2020; Jamil & Howard-Matthews, 2025; Mehta, 2022). Co-creation challenges established instructional routines and institutional norms and requires shifts in responsibility and participation. Its implementation can therefore unsettle familiar classroom practices and bring competing demands into play (Reh, Rabenstein, et al., 2015). These competing demands can materialize as tensions within the classroom system, where they are experienced by teachers and students (Blaushild et al., 2025; Lomba-Portela et al., 2022; Schaap & Vanlommel, 2024; Welton, 2024). Research on educational change suggests that change efforts often fail when such

emerging tensions are insufficiently understood or not productively navigated (Schaap & Vanlommel, 2024; Vanlommel & Steeno, 2025).

To understand how co-creation in learning and teaching unfolds under the structural conditions of schooling, it is therefore necessary to examine which tensions emerge in such processes, how they are experienced by teachers and students, and how participants describe navigating them. Deeper Learning offers a particularly suitable setting for this inquiry. In the model applied here, it is a phased teaching and learning approach in which co-creation lies at the core, enabling students to actively shape their learning and fostering deep, personally meaningful learning experiences (Sliwka et al., 2024; Sliwka & Klopsch, 2022). Against this background, the present study investigates co-creation in learning and teaching in a secondary school setting through the lens of paradox theory (Jarzabkowski et al., 2013; Smith & Lewis, 2011). It asks:

How do paradoxical tensions shape co-creation in learning and teaching in Deeper Learning settings and how do teachers and students engage with them?

(1) How are these tensions experienced by teachers and students?
(2) How do teachers and students describe navigating these tensions?

THEORETICAL BACKGROUND

Co-Creation in Educational Contexts: What does it mean to learn and teach co-creatively?

Co-creation is a cross-disciplinary concept with varying meanings across fields. Across these uses, several facets stand out: multiple stakeholders engage in dialogic and distributed collaboration, combine perspectives, engage in meaning-making and creative problem-solving, and aim to generate innovative outcomes and shared value (Ansell et al., 2022; Dahm & Heydenreich, 2024; Kreiling & Paunov, 2021; Messiha et al., 2025; Prahalad & Ramaswamy, 2004). Taken together, these facets point to a basic conceptual core reflected in the term itself. It combines the prefix *"co–"*, denoting dialogue, partnership, reciprocity, and shared authorship, with *"creation"*, referring to the act of bringing something new or original into being, whether knowledge, artefacts, or innovative solutions (Jamil & Howard-Matthews, 2025; Kaminskienė et al., 2020, p. 340).

In educational settings co-creation is frequently framed as a pedagogical idea that emphasises learner empowerment and meaningful participation (Jamil & Howard-Matthews, 2025). This pedagogical idea has been developed most extensively in higher education (HE) research, where co-creation is often discussed in relation to student-staff collaboration and broadly refers to participatory approaches that position learners as active contributors to shaping essential dimensions of learning and teaching, including curricula, pedagogical approaches, and ongoing learning processes (Bovill et al., 2015; Cook-Sather & Kaur, 2022; Gandt et al., 2024a; Omland et al., 2025). The HE perspective indicates an important shift from broader uses of co-creation. In education, co-creators are not primarily external stakeholders, customers, or users, but learners within pedagogically and institutionally structured relationships.

Transferring co-creation to school settings therefore requires further clarification on what is co-created, who is participating and how such processes are pedagogically initiated, supported, and embedded in schooling.

What is co-created, however, can differ. Co-Creation can "unfold in various arenas of engagement, including: learning, teaching, assessment […] and curriculum design" (Cook-Sather & Kaur, 2022, p. 3). While this clarifies possible objects of co-creation, Bovill (2020b) further differentiates between distinct forms of co-creation, with regard to timing and the scope of participation. She distinguishes "*co-creation of the curriculum"*, which refers to participatory design processes prior to implementation, from "*whole-class co-creation in learning and teaching"*, in which all learners in a group participate in negotiating and shaping elements of their learning journeys as learning unfolds (Bovill, 2020b, p. 1025). The latter locates co-creation within the ongoing process of teaching and learning (Jörissen & Grein, 2025). This form of co-creation is particularly relevant to school settings, since learning is typically organized in large classroom groups. Examining it at the classroom level is especially important in the German context, as students report "very limited opportunities to shape teaching and learning" (Robert Bosch Stiftung, 2026, p. 45). Therefore, this study focuses on whole-class co-creation at a classroom-level.

At the same time, whole-class co-creation in school classrooms should not be reduced to teacher-student relations. Co-creation may also involve students in relation to peers, other educational staff, parents, or external experts. Among students, co-creation may unfold, for example, when they negotiate ideas and develop shared artefacts. This understanding is grounded in a constructivist view of learning (Horlenko & Kaminskiene, 2022; Jamil & Howard-Matthews, 2025; Reich, 2010).

Building on existing definitions and the preceding distinctions, this study understands co-creation in learning and teaching as a collaborative, interactive process in which participants combine their knowledge, skills, and experiences, negotiate their perspectives and ideas, share decision-making power over aspects of the process and outcome, and jointly create outcomes that

are novel and meaningful to those involved (Beghetto & Karwowski, 2025; Bovill, 2020b, 2020a; Gandt et al., 2024b; Jamil & Howard-Matthews, 2025; Jörissen & Grein, 2025; Kaminskienė et al., 2020; Messiha et al., 2025; Prahalad & Ramaswamy, 2004; Vollmer, 2020; Zarandi et al., 2024). In what follows, "co-creative" is used as the adjectival form of co-creation in learning and teaching.

Deeper Learning as pedagogical setting for co-creation

The present study examines co-creation within Deeper Learning (DL) settings. DL is used internationally as an umbrella term encompassing approaches to the future of schooling centred on deep understanding, meaningful engagement and the development of capacities and competencies needed to navigate complex and changing contexts (Darling-Hammond & Oakes, 2019; Fullan et al., 2018; Harring et al., 2024; Mehta & Fine, 2019; Warkentier et al., 2017). One influential approach by Mehta and Fine (2019) conceptualises such learning as emerging at the intersection of three core "qualities: mastery, identity, and creativity" (Mehta & Fine, 2019, p. 299). Learners develop knowledge and skill, connect what they learn to their sense of self, and enact their learning by creating and producing something rather than merely receiving knowledge (Mehta & Fine, 2019). In the present study, DL refers more specifically to the pedagogical model developed by Sliwka and Klopsch (2022), which explicitly embeds co-creation (Klopsch & Sliwka, 2024). The theoretical model combines teacher co-design with a three-phase learning sequence: "Instruction and acquisition (phase I), co-construction and co-creation (phase II), and authentic performance (phase III)" (Sliwka et al., 2024, p. 106). Sliwka and Klopsch (2022, p. 25) describe the phase of co-construction and co-creation as the "heart" of DL. This explicit centrality of co-creation makes DL settings based on the model particularly suitable for investigating how co-creation unfolds in classroom practice.

However, DL does not automatically translate into co-creation. Whether and how co-creation emerges and unfolds in practice depends on how teachers design, initiate, and support the second phase, as well as on how students engage with the opportunities for joint creation it affords. In designing for co-creation, teachers draw on didactical elements such as challenging tasks, feedback structures and incorporate elements associated with e.g. "project-, problem-, or design-based learning" (Sliwka & Klopsch, 2022, p. 106 ff.). These didactical elements are used to mimic aspects of real-world work. To open age-appropriate spaces for shared decision-making and thereby fostering co-creation within the constraints of schooling, voice and choice is used. This central didactic principle offers students agentic opportunities to influence aspects of the learning process and outcome, such as the use of media or the content and form of the outcome (Klemenčič, 2022; Sliwka & Klopsch, 2022; Strating et al., 2025).

Although co-creation has gained increasing attention, empirical research on how such processes unfold in school classrooms remains limited (Cook-Sather, 2020b; Geurts et al., 2024; Kaminskienė et al., 2020; Omland et al., 2025). In particular, little is known about how co-creation in learning and teaching is experienced under the structural conditions of schooling. As outlined above, opportunities for co-creation in classrooms have to be initiated by teachers because classroom-level co-creation is embedded in institutionally shaped asymmetrical power relations, curriculum constraints, and assessment requirements.

Theoretically, this suggests that bringing co-creation into classroom practice is likely to generate tensions. Co-creation introduces demands that sit uneasily with established teaching and learning practices (Gandt et al., 2024a). By redistributing agency, inviting shared authorship, and opening decision-making spaces, it challenges conventional role patterns, institutional norms and expectations of control within schooling (Feichter, 2020; Reh et al., 2015). From this perspective, integrating co-creation into classroom practice may unsettle established learning cultures and therefore bring competing demands into play, which can give rise to tensions (Feichter, 2020; Malter, 2025; Reh, et al., 2015; Schaap & Vanlommel, 2024).

Paradox Theory as an Analytical Lens

To examine possibly occurring tensions, this study draws on paradox theory (Jarzabkowski et al., 2013; Lewis & Smith, 2022; Schaap & Vanlommel, 2024; Smith & Lewis, 2011; Vanlommel & Steeno, 2025). Paradoxes refer to tensions caused by "contradictory yet interrelated elements that exist simultaneously and persist over time" (Smith & Lewis, 2011, p. 382). Rather than framing competing demands as dilemmas requiring resolution, paradox theory adopts a both/and logic, emphasizing dynamic equilibrium and ongoing navigation (Schaap & Vanlommel, 2024).

Smith and Lewis (2011) distinguish four categories of organizational paradoxes: learning, belonging, organizing, and performing. These tensions emerge when competing yet interdependent demands coexist, such as the need for change and stability, external and internal expectations, challenge and support, cooperation and competition or connection and autonomy. Although the poles of a paradox appear contradictory, both remain necessary for achieving an organisation's mission (Welton, 2024). In practice, such paradoxes rarely appear in isolation but intersect and cascade across levels, meaning attempts to address tensions in one domain may generate new challenges in another, resulting in interwoven constellations or paradox systems (Jarzabkowski et al., 2013; Lewis & Smith, 2022).

Educational change research shows that responses to tensions can "make or break systemic school

improvement" (Welton, 2024, p. 36). This is particularly relevant for co-creation at the classroom level, where shared decision-making-power, student authorship, teacher responsibility, and institutional requirements must be held together. How teachers and students respond to occurring tensions matters: defensive either–or reactions tend to reinforce vicious cycles by privileging one pole at the expense of the other, thereby intensifying underlying contradictions. In contrast, generative both–and responses involve ongoing balancing, which can contribute to changes in learning culture (Schaap & Vanlommel, 2024; Smith & Lewis, 2011; Vanlommel & Steeno, 2025).

In this study, paradox theory therefore serves as an analytical lens to examine which tensions teachers and students experience in co-creation in learning and teaching, how they describe navigating them, and how this shapes what co-creation can become in the classroom.

METHOD AND DATA

Research Design and Case Selection

This paper forms part of a larger exploratory qualitative multiple case study investigating co-creation in secondary school DL settings (Hamilton & Corbett-Whittier, 2013; Vohra, 2024; Yin, 2018). The broader research project explores how students and teachers experience, enact, and reflect on co-creation in learning and teaching and combines several qualitative methods.[1]

The overall study includes three purposively sampled cases implemented in secondary schools (two in Germany and one German international school abroad). Each case is defined as the phase of co-construction and co-creation within an interdisciplinary Deeper Learning sequence, following the phase model by Sliwka and Klopsch (2022), situated in its specific school context[2]. Student and teacher perspectives served as embedded units of analysis (Yin, 2018).

The present paper focuses on the international school case, one of three cases in the larger study. It was selected as an information-rich case, because it combined (a) an established, award-winning learning design, (b) iterative refinement of the learning design informed by student feedback, (c) experienced teachers, (d) extensive voice and choice, (e) a timely topic (AI), and (f) a public performance that made students' co-created outcomes visible beyond the classroom. The present article draws on interview data from the selected case, consisting of three teacher interviews and six student group interviews with 21 students (aged: 16-17; mean age: 16.4) (Flick, 2012). The semi-structured interviews were conducted after the phase of co-creation and explored participants' experiences of co-creation, including challenges, forms of support, and ways of navigating the learning process. Interviews were selected because they provide insight into how students and teachers interpret, reflect on, and make sense of tensions emerging in co-creation.

Case Description

The analysed case centres on the co-creation phase of an interdisciplinary Deeper Learning unit on artificial intelligence, entrepreneurship, and ethics conducted in Grade 10 at an international secondary school. The unit involved two parallel classes, and Phase II unfolded over four project days, including half-day sessions. The learning design had already been implemented several times and had received external recognition for innovative educational practice. It was collaboratively designed by three teachers from Economics, Information Technology, and Ethics, who rotated in facilitating the co-creative phase.

During co-creation, students were assigned to competence-based, heterogeneous teams of three to four students composed across the two classes. The co-creative work was framed by an entrepreneurial design challenge in which teams developed AI-based start-up ideas addressing self-selected real-world problems.

Each team had to justify its business model economically, design an algorithmic blueprint, and critically evaluate ethical implications based on AI ethics principles. The intended outcome was a "professional" startup pitch modelled on authentic entrepreneurial practice.

The learning design of the co-creative phase modelled elements of professional work by translating design-thinking-oriented practices, such as problem exploration, ideation, prototyping, feedback, and iterative refinement, into age-appropriate and optional scaffolding materials. Rather than prescribing a fixed sequence, these materials offered orientation for students' work. The learning design used voice and choice to grant students substantial agentic opportunities in shaping their ideas, organising their workflow, and making group decisions. Additionally, students received ongoing teacher facilitation and peer feedback from older students who had completed the same project in the previous year. The co-creative learning process culminated in a public "Shark Tank"-style pitch event, where teams presented and defended their startup concepts before a broader school audience and external industry experts.

[1] To capture processes of co-creation comprehensively, multiple qualitative data sources were collected. These include audio-supported field observation (> 28 h of recorded co-creative action), semi-structured student group interviews, teacher interviews, open-ended pre–post questionnaires, and the collection of learning materials and student artefacts (Flick, 2012; Hauk & Gröschner, 2024). This comprehensive data corpus allows for the reconstruction of co-creative practices at both interactional and experiential levels.

[2] Across cases, 18 student teams (N = 66 students; Ø age: 16,8) and ten teachers participated.

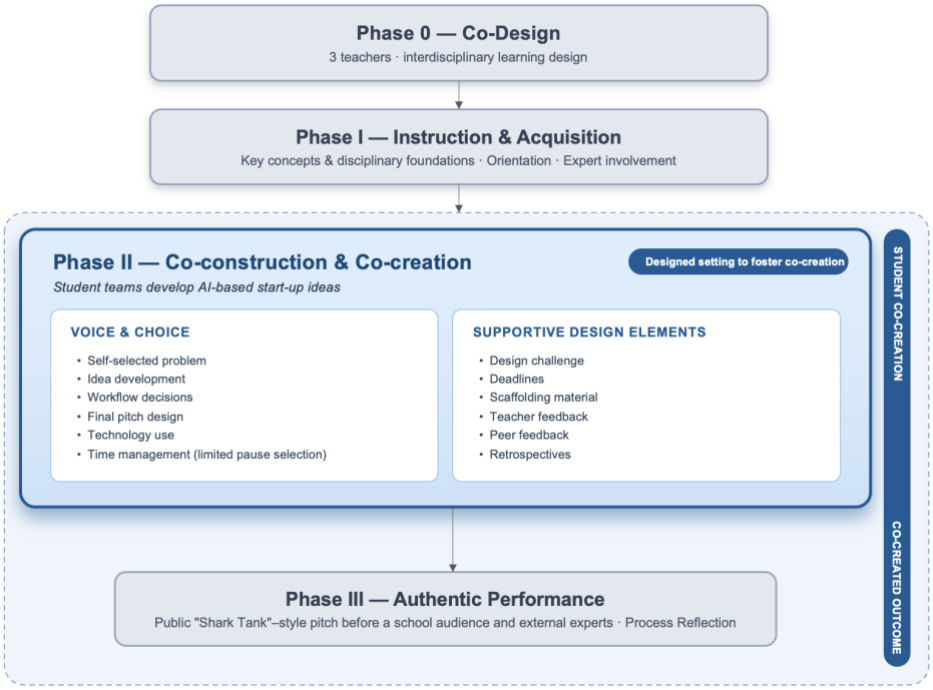

Fig. 1. Overview of the analysed case with case context

Data Analysis

The interviews were transcribed and analysed using qualitative content analysis with MAXQDA (Dresing & Pehl, 2018; Kuckartz & Rädiker, 2022, 2023). The analysis proceeded in several steps. First, interviews were coded to reconstruct how students and teachers made sense of co-creation, with particular attention to perceived opportunities, challenges, support, group dynamics, and role experiences. Since many of the described challenges were tension-laden, these challenge-related categories were examined in a subsequent theory-informed step through the lens of paradox theory (Lewis & Smith, 2022; Smith & Lewis, 2011). Tensions were interpreted as paradoxical when participants described competing yet interdependent demands, they experienced as simultaneously relevant for co-creation. Student and teacher perspectives within the case were subsequently compared to identify convergences and differences in how these tensions were perceived and navigated. The coding process and emerging interpretations were discussed within the research group. Three recurring and particularly salient tension fields were identified as central to participants' accounts of co-creation in learning and teaching and are presented below.

EMPIRICAL RESULTS

The analysis points to an interwoven constellation of paradoxical tensions that participants described as relevant for co-creation in the selected case. Within this broader constellation, the three tensions presented in Table 1 are foregrounded because they provide particularly generative entry points for understanding how co-creation was experienced and navigated.

Table 1. Selection of Experienced Paradoxical Tensions in Co-Creation

Empirically Identified Tensions	Paradox Lens	Student Perspective	Teacher Perspective
Structured Freedom	Organizing	Autonomy ↔ Control	Guidance ↔ Open Exploration
Shifting Teaching Roles	Learning:: Belonging		Teachers as experts ↔ Teachers as co-learners
Human-AI Co-Creation	Learning:: Performing	Human Authorship ↔ AI-enabled possibilities	Human Authorship ↔ AI-enabled possibilities

Structured Freedom

Across interviews, Structured Freedom emerged as a central paradoxical tension articulated in both student and teacher accounts. It can be understood as an organizing paradox because the phase of co-creation was organised through openness and structure as simultaneously enabling and constraining conditions. Students and teachers experienced it in perspective-specific ways. This shared tension was closely tied to the learning design itself. The learning design combined clearly defined structural elements (e.g. fixed deadlines, interdisciplinary requirements, feedback loops, and performance expectations) with substantial opportunities for students to shape ideas, organise their workflow, and make group decisions. Structured Freedom therefore functioned as an organising configuration through which participants experienced and navigated co-creation in the classroom.

Student Perspectives: Navigating Structured Freedom by exercising Agency

Students predominantly experienced Structured Freedom during co-creation as a meaningful expansion of autonomy compared to their regular schooling. Many emphasised the opportunity to organise their workflow, shape ideas independently, and make substantive decisions:

> "Giving us freedom, is like they told us: 'We trust you,' and we should not break their trust." (G4[3]; P4; 37)

> "For me personally, it was really nice that we could work in a group and manage our own time. We were truly independent in our project. We had a deadline and everything had to be finished by then. You could do what you wanted, but it had to be done by that point. That was really good and, at least for me, felt like a model of future work." (G3;P2; 26)

> "It was good to think in such an innovative way. I think it's a good idea to give us time to figure things out ourselves instead of teachers always telling us what to do." (G1;P3;27)

> "I mean, we had almost complete freedom in everything. 'Teacher 1' helped a little at the beginning with figuring out the idea, but apart from that, we actually had the possibility to decide on all the ideas ourselves and to make all the decisions ourselves. We could ask the teachers if we had questions, which was good. But most of it we then did on our own, together, and made decisions together." (G2;P2;44).

Students seem to associate freedom with trust and responsibility, while also perceiving it as structured through deadlines and available teacher support or guidance. Within this setting, they engaged in co-creation by pursuing their own ideas, working collaboratively and making decisions together.

At the same time, students remained aware of performance expectations and monitoring. One student described this ambivalence as follows:

> "We had this freedom to decide ourselves when to take breaks. But when we took a break and then one teacher came around controlling whether we were actually working, it created a bit of pressure […] I had to keep talking to myself: should I be working now, even though we had decided to take a break?" (G5;P3;116)

This moment illustrates how experienced autonomy could shift into felt pressure or control when self-directed decisions became subject to monitoring. Their accounts also show that they dealt with this through collaborative practices that shaped the endeavour as a whole. Groups described discussing ideas, checking whether others agreed, and making decisions together:

> "Whenever a decision came up, I talked with the group about whether it was a good idea or not. I think in almost all cases, whenever there was a decision, we always asked the others to make sure that everyone was on board." (G6; P3; 63)

> P2: "If one person thought it was not a good idea, we obviously said so and then discussed it."
> P3: "Almost too much discussion, I think."
> P1: "Yes, but that means we were really interested and wanted to succeed. If we had not discussed it, it would not have mattered enough to us." (G3; P1,P2,P3; 109-111)

These accounts suggest that shared decision-making helped students coordinate freedom collectively and sustain the co-creative process despite disagreement and occasional pressure. However, students did not navigate Structured Freedom only within their peer groups.

Teacher intervention was not experienced solely as restrictive. In moments of uncertainty, students sought help and described teacher input as a resource that contributed to co-creation:

> "In phases when we didn't really know how to move forward, a teacher would come by, look at our product, and share their perspective on options we had or what they would do. We often tried their suggestion and used their advice. Even if we didn't fully follow it, it helped us get unstuck. That's really important when you work on the same thing for a

[3] G4: Group 4; P4: Student 4, the team comprised 4 members; 37: Position in the MAXQDA transcript)

> whole week, to stay motivated and keep the workflow going." (G1;P1;46)

Students selectively integrated feedback into their own emerging ideas, using it to refine their concepts. However, the timing of structural teacher interventions mattered. As one student noted:

> "I think the Meet-ups and short inputs during the day and NOT at the beginning or end, were really disruptive for our workflow because we were VERY focused on our work." (G6;P4;29)

This suggests that support was experienced in relation to the group's current workflow. When it connected to students' needs, it helped them sustain co-creation. When it interrupted collaborative work, even supportive measures could be experienced ambivalently. The reference to being "very focused" may cautiously point to flow-like moments of group engagement. Taken together, these accounts suggest that the Structured Freedom embedded in the learning design expanded students' opportunities to exercise agency through developing ideas, organizing their work, and making collective decisions.

Teacher Perspective: Designing, Holding and Navigating Structured Freedom

Teachers described Structured Freedom as a deliberate balancing act between providing guidance and leaving room for autonomous exploration. This balancing act had both a design dimension and an in-situ dimension. In relation to the learning design, teachers invested considerable effort in anticipating student needs and designing scaffolding materials that functioned as guardrails or catalysers for co-creation. These guardrails were intended to provide enough structure to prevent overload while preserving students' room to develop their own ideas, make decisions, and take creative risks. As one teacher explained:

> "Of course, the framework is set. But what product they ultimately develop is completely up to them. The scaffolding is there, and I think that's important. But their say in the project is actually quite large." (T1;2)

Another teacher described this preparatory work metaphorically as creating a "playground" (T2;4): a structured space within which students can move freely.

During co-creation, however, Structured Freedom still required continuous professional judgement. Teachers had to decide when guidance would support students' work and when it would interrupt open exploration. One teacher described this in-situ judgement as follows:

> "In certain phases, I set expectations tied to the project. Sometimes I simply mirror things I notice for example when a group is working particularly well or not so well. I often sit down with them and first ask if I can just listen. If I feel I can give a meaningful impulse, I do. If I sense they're working intensely and I would just interrupt, I move on." (T3; 48)

This illustrates the adaptive guidance required in situ. Teachers continuously weighed whether intervention would advance or disrupt co-creative learning. As another teacher reflected:

> "You can't always tell whether they're deeply engaged in research or completely lost. So you have to keep checking in with each team regularly […] But it's also a typical teacher problem to give advice when it's not needed. You have to carefully consider whether a small nudge makes sense without giving away the solution." (T2;117-118)

Teachers acknowledged that their strong support orientation sometimes tempted them to intervene too quickly. At the same time, they associated freedom with responsibility:

> "No one tells them: first do this, then that. They have to make their own plan and shape the process themselves. That means they have to take more responsibility. In regular lessons, we sometimes don't dare to do that because we feel like we might lose control." (T1;17)

Leaving room for exploration thus seemed to confront teachers with their own concerns about losing control. In this co-creational context, however, teachers intentionally accepted this uncertainty. They observed that most students responded positively to the autonomy granted:

> "I would say 90% deal with it very positively. They really burn for their projects. There's intrinsic motivation and the desire that THEIR app or whatever they came up with actually works. With one or two groups, I saw they were a bit lost from time to time. They would probably need a tighter framework and more guidance." (T2;6)

This points to the differentiation challenge inherent in co-creative processes. One teacher described this balancing act explicitly:

> "Setting boundaries and providing structure is always about differentiation and support, especially with complex problem solving. It's important that it doesn't become arbitrary and that there's a good structure, for example through documents. But the freedom and the motivation that comes from that freedom are just as important. Finding that middle ground is really difficult. Maybe this time it was a bit too structured. You always have to decide spontaneously: where are they right now, what do they need?" (T3;55)

Scaffolding materials were described as optional supports rather than mandatory steps:

> "The material doesn't have to be used in such a detailed way by every group." (T1;42)

Beyond process quality, teachers linked Structured Freedom to broader developmental aims:

> "My biggest goal is to really help students find a bit of who they are. You only discover that in complex projects… in the content, in the process, or in your role in the group. That's part of a socialisation and self-discovery process. And to spark enthusiasm, to show how much fun it can be to enter a flow experience and work intensively on something – that also prepares them for the future." (T3; 20)

Taken together, teachers described the orchestration of conditions under which students could exercise agency while still receiving guidance. They held together guidance and open exploration at both the design and process level, opening space for students to assume responsibility for ideas, decisions, and workflow, while remaining accountable for curricular quality.

Role Shifts in Co-Creation

Role shifts emerged across both teacher and student accounts, although they took different forms. Teachers described a pronounced tension in their professional self-positioning as they sought to remain responsible experts while also engaging as co-learners. Students likewise assumed a more active and agentic role in the co-creative process, but this shift was not itself experienced as a salient paradoxical tension.

Teacher Perspectives: Reflecting on Shifting Roles

At the level of self-perception, teachers described a further paradoxical tension related to their professional identity and self-positioning within the co-creative learning process. This tension can be described as a Learning::Belonging paradox, as teachers reconsidered established conceptions of their professional role.

Teachers explicitly articulated the need to move away from a traditional explanatory stance:

> "You really have to shift and put a lot into the students' hands and detach yourself from the explaining role. That's not always easy. Letting go and sometimes letting them fail, even when you see it won't work… that's a big challenge. But also, a big gain." (T2;26)

The shift was described as both professionally demanding and personally rewarding, requiring teachers to tolerate uncertainty and resisting the impulse to intervene prematurely. Another teacher framed this even more explicitly:

> "I'm not the expert in the sense that I have to provide all the answers. My role is to create the contextual conditions so that students can become experts – maybe even better experts than me in certain areas. That requires a lot of self-confidence and a basic attitude that I'm not the 'sage on the stage', but someone who supports and accompanies them and ensures the conditions for creative learning." (T3; 89)

This statement suggests that expertise was enacted less through providing answers and more through designing conditions in which students could develop their own expertise.

At the same time, teachers acknowledged that this repositioning involves inner tension. One teacher reflected:

> "It requires a certain mindset and conviction to loosen the reins and let students run. That's also about self-perception as a teacher." (T1; 66)

Teachers described having to trust that students could acquire knowledge independently, even in domains that extended beyond the teacher's own expertise:

> "I have to trust that they can appropriate parts of it themselves. I have to allow them to enter knowledge domains that I may not master myself. I have to be open to learning a lot myself and learning FROM the students." (T2; 94)

This willingness to learn alongside students suggests that teachers did not stand outside the co-creative process as mere supporters or designers. Teachers also participate in processes of exploration, discovery, and sometimes shared uncertainty. They described this role-shift as follows:

> "I find it really beautiful to accompany students through such a process and spend so much time with them. Otherwise, you don't perceive them in the same way. This relational dimension is often the most beautiful part of these formats. After the week, you feel that you've grown together and that they perceive you differently." (T2; 100)

Teachers seem to navigate a both–and stance in their professional role, positioning themselves as responsible professionals who enact expertise in different forms while engaging temporarily as co-learners and co-creators. The deliberate holding and navigation of these competing role demands can thus be understood as an expression of teacher agency.

Student Perspectives: Assuming a More Agentic Role in Co-Creation

Students likewise appeared to assume a more active and agentic role in the co-creative process, but this shift was not itself experienced as a major source of tension. Tensions emerged instead in collective decision-making within the teams, particularly when individual voices and ideas had to be negotiated and integrated into a shared outcome.

Human-AI Co-Creation

A more exploratory finding concerns the role of AI in the co-creative process. Since students were allowed to use AI tools, several accounts point to a tension between AI-supported ideation and human authorship.

Student Perspectives: Augmenting Co-Creation while Maintaining Human Authorship

On the one hand, AI was described as a useful resource within the co-creative setting:

> "We had so many resources. We could ask other people, we could create everything ourselves, use a bit of AI to get suggestions. We used it to invent our start-ups name" (G4;P2;16)

> "Through this freedom we could really let our creativity run free. And if we didn't have ideas, if we didn't know how to move on, we could also use ChatGPT or other tools. That really helped in many cases, for example with the design of a professional logo or a slogan." (G3;P1;31)

In these accounts, AI functioned as a sparring partner that supported ideation and helped overcome creative blocks. AI-suggestions were perceived as helpful impulses. AI was thus integrated into the human-led process as one tool among others.

At the same time, one student account suggests that AI use could become problematic when it was perceived undermining students' own idea development:

> "At the beginning I had, I think, a really bad group. I think their creative expression wasn't really creative. One of them used ChatGPT for ideas. I didn't like that. So I asked the teacher to change groups. Then I got into a better group, one that communicated better and really thought creatively about the problems." (G6;P2;54)

This reservation contrasts with accounts in which AI was used to support the realisation of an idea that students experienced as their own:

> P1: "I worked a lot on the prototype and coded it with ChatGPT"
> P2: "Yeah. It was really cool that our idea actually worked in the end"
> P1: "well, at least a little bit." (G1; P1,P2; 12)

Here, the distinction appears to lie in how AI support was experienced in relation to students' sense of contribution and ownership.

Teacher Perspective: Designing for Meaningful Human Contribution

One teacher explicitly reflected on the AI-related tension from a pedagogical perspective. The teacher described AI as substantially extending what students could achieve during co-creation, while simultaneously increasing the need to make students' own role in the creative process explicit and subject to reflection.

> "We do far too little modelling. With AI use, we could show students: this is how I can use AI, but these are the problems that come with it, and this is my role in the creative process. Then we can expand successful AI use." (T1; 170)

> "It is a major challenge to design the learning setting in a way that makes co-agency both necessary and possible, so that co-creation is not something that can be done with just one prompt." (T1; 168)

Rather than framing AI use as inherently problematic, this account suggests a both–and orientation. AI can extend co-creative possibilities, while meaningful student contribution and engagement remain essential, making the design of learning settings that sustain both a pedagogical challenge.

From a paradox perspective, the AI-related finding can be interpreted as a Learning::Performing tension. On the performing side, AI can increase efficiency and extend what students are able to co-create within a limited timeframe and support the realisation of more complex outcomes. On the learning side, students accounts emphasised the importance of developing ideas themselves, remaining cognitively engaged, and experiencing the outcome as genuinely "their own." Ownership thus appeared to function as an important criterion in how AI use was evaluated. When students experienced the product as jointly authored, AI use seemed acceptable as support for realising "our idea," but problematic when it appeared to substitute human originality and meaningful human contribution. The teacher perspective complements this pattern.

DISCUSSION AND CONCLUSIONS

This study examined which paradoxical tensions take shape when co-creation in learning and teaching is implemented at the classroom level, how teachers and students experience these tensions, and how they describe navigating them. In doing so, it contributes to understanding how co-creation unfolds under the structural conditions of schooling.

The findings show that teachers and students experienced paradoxical tensions in the co-creative process, particularly in relation to Structured Freedom, teacher expertise and co-learning, and AI-enabled possibilities and human authorship. The findings further suggest that productive co-creation depends on keeping certain competing yet interdependent elements in play. Co-creation thus appears to be constituted through maintaining and continuously navigating these interwoven tensions.

A paradox perspective is particularly useful for interpreting this pattern because it shifts attention away from treating emerging tensions as implementation problems that need to be resolved and helps explain why apparently opposing demands remain simultaneously necessary and why privileging either pole may undermine the co-creative process itself. Across the three focal tensions, both poles remained relevant. Teachers could therefore remain responsible professionals with expertise while also positioning themselves, at least temporarily, as co-learners and co-creators.

The tensions identified in this study can therefore be understood as part of the process through which co-creation, "as an innovative [...] pedagogical approach," becomes enacted within existing conditions of schooling (Jamil & Howard-Matthews, 2025, p. 5). By introducing different demands into established classroom practices, co-creation unsettles existing patterns and requires ongoing navigation. Students' and teachers' accounts often point to a both/and logic approaching these tensions. This might allow participants to reconfigure established practices in ways that sustain co-creative processes.

Viewed systemically, the three tensions highlighted in this case are interwoven. This means that tensions embedded in the learning design may become salient in participants' experiences and interactions and may, in turn, shape how the learning arrangement is subsequently enacted and adapted. Structured Freedom provides a clear example of this dynamic, which can explain why students and teachers articulated related tensions in perspective-specific ways.

First, Structured Freedom emerged as a central organising principle of classroom-level co-creation. At the level of learning design, it simultaneously opened and bounded the learning setting. Teachers designed structural conditions for co-creation by establishing, for example, deadlines, support, quality requirements, scaffolds, and feedback structures, which constrained what could be negotiated. At the same time, substantial decision-making space was opened. In this sense, Structured Freedom functioned as an enabling constraint: by delimiting a reliable context for action and decision-making, it created agentic opportunities that students could take up.

Students exercised agency within this setting by taking initiative, pursuing their own ideas, organising their work, making collective decisions, and seeking support when needed. At the same time, they remained aware of deadlines, performance expectations, and moments of teacher monitoring. From their perspective, navigating learning settings that integrated Structured Freedom as a design configuration was primarily associated with autonomy, trust, and responsibility, but could also be experienced as control when monitoring or teacher intervention appeared to override self-directed decisions. Autonomy and perceived control therefore emerged as an experience-level tension connected to Structured Freedom and teacher–student interaction.

Interestingly, the co-creative process seemed to falter when this tension shifted too strongly toward one pole, for example when guidance was experienced as control. This suggests that co-creation seems to depend on maintaining a productive relationship between student agency and pedagogical boundaries. Students' association of freedom with trust resonates with Bovill's finding that "co-creation relies on students and teachers trusting and respecting one another and recognising that responsibility for learning is shared" (Bovill, 2020b, p. 1031). Structured Freedom might even catalyse student co-creation, since it was experienced as activating by most students.

For co-creation to occur at the classroom level, teachers have to initiate it. This aligns with a theoretical assumption from the higher education literature (Horlenko & Kaminskiene, 2022). Yet the school context makes this particularly demanding. Because classroom-level co-creation is embedded in asymmetrical power relations, and because teachers remain accountable for the quality of learning, they have to initiate and safeguard the process while giving students enough room to shape it. Teachers navigated this tension through anticipatory design and adaptive guidance (Parsons et al., 2018). This form of professional practice was experienced as demanding, even though the co-creative process was intentionally designed and initiated by the teachers themselves. This is theoretically significant because asymmetries are not eliminated but enacted differently. The present findings suggest that more distributed decision-making agency does not necessarily require symmetrical responsibility.

Second, teachers' reflections on shifting roles point to a tension at the level of professional identity. Teachers did not position themselves as fully equal partners in classroom-level co-creation, because they remained accountable for the quality of the learning process and were involved in adaptive guidance. At the same time, co-creation required them to step back from a traditional explanatory role, tolerate uncertainty, and enable students to develop expertise of their own. The findings suggest that teachers navigated this tension by enacting expertise differently, e.g. through designing enabling conditions, carefully judging when to intervene, and participating, at least temporarily, in student-led processes of co-creation.

Third, the exploratory AI-related finding introduces a further layer to this paradox system. Student accounts suggest that the role of AI in co-creation was evaluated in relation to students' sense of ownership and authorship. AI use appeared acceptable when it helped students realise an idea experienced as "our idea," but problematic when it seemed to replace the group's own thinking or idea development. From this perspective, the underlying tension may be better understood as one between AI-enabled possibilities and human authorship.

AI support can extend what students are able to produce, support ideation, and enable more complex outcomes. At the same time, meaningful co-creation appears to depend on students continuing to experience themselves as substantive contributors to the emerging outcome. Collective ownership may help sustain the both–and relationship between AI-enabled possibilities and meaningful human authorship by providing a criterion for when AI support remains part of, rather than a substitute for, co-creative work. The teacher perspective complements this pattern by highlighting the need to design learning settings in which AI extends what students can achieve without replacing meaningful human contribution.

Notably, students did not foreground AI more strongly in their accounts and described AI as one tool among others. One possible explanation is that interaction with AI often occurs individually and may therefore remain less visible within the collectively experienced process of co-creation, particularly when it takes place outside shared discussion and decision-making.

Taken together, the findings point to an interwoven system of tensions across learning design, teacher enactment, student experience, and AI-supported activity, whose ongoing navigation appears to constitute classroom-level co-creation. Figure 2 integrates these interrelations into a conceptual model, while Table 2 provides a concise synthesis of the conditions that need to coexist for co-creation to unfold and the ways in which participants navigated the respective tensions.

Overall, the findings point to practical implications for implementing co-creation in schools. Co-creation should not be understood as simply giving students more freedom. Rather, it requires carefully designed and responsively facilitated learning settings that take students' authorship seriously while ensuring guidance, accountability, and educational quality.

In this sense, co-creation may offer a small but concrete starting point for rethinking and gradually reconfiguring established learning cultures. Read cautiously, students' and teachers' accounts provide an initial glimpse of how such changes may begin to take shape in classroom practice.

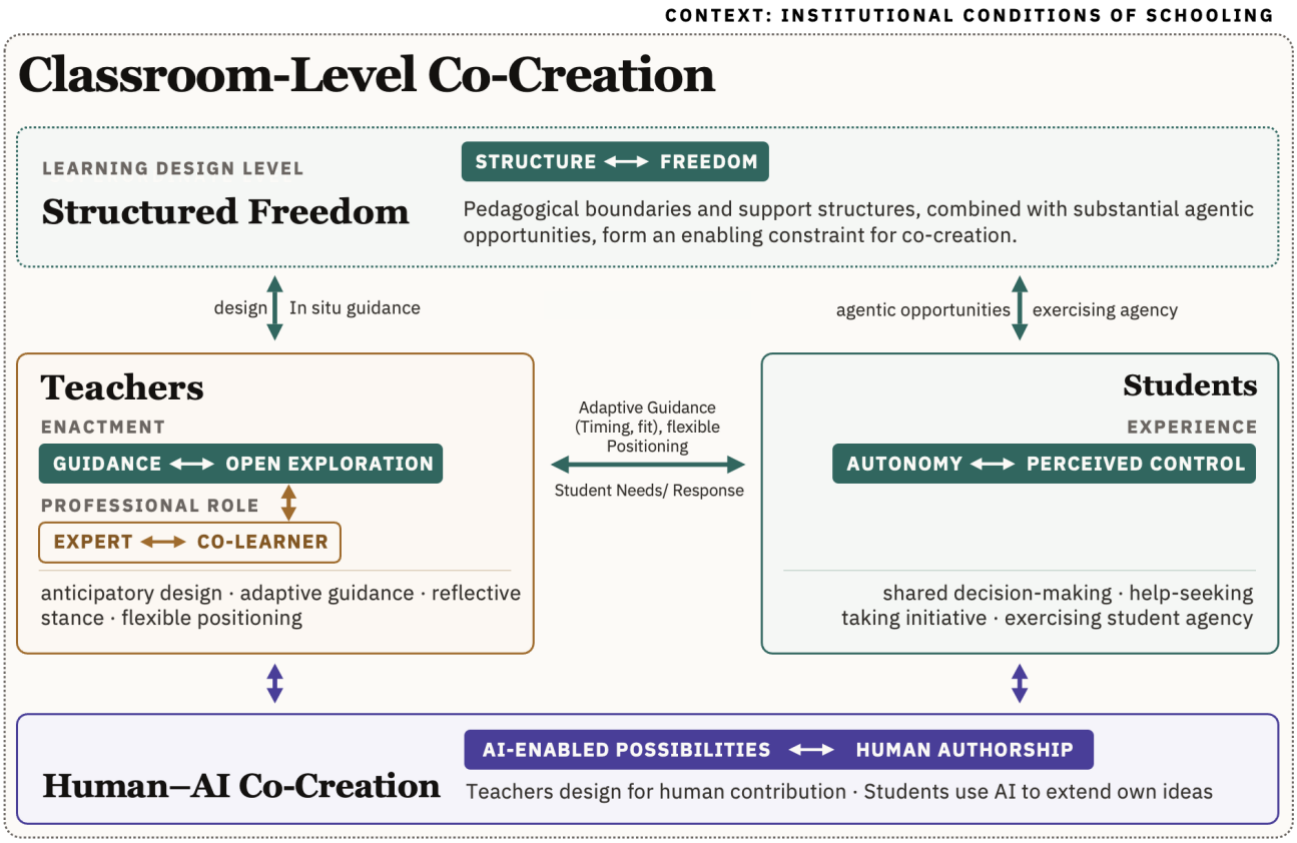

Fig. 2. Conceptual model of how paradoxical tensions shape classroom-level co-creation

Table 2. Sustaining Classroom-Level Co-Creation: Co-existing Conditions and Navigation Practices

Paradoxical tension	What conditions need to co-exist for co-creation to unfold?	How do participants navigate the tension?
Structure ↔ Freedom	Pedagogical boundaries and support structures need to coexist with meaningful agentic opportunities, shared decision-making power, and shared responsibility despite asymmetrical accountability.	**Teachers** anticipate support needs and build scaffolds, guardrails, feedback structures, and expectations into the learning design, while creating and sustaining substantial opportunities for student decision-making through voice and choice. In situ, they offer advice and feedback and adapt guidance to students' needs by judging when to intervene, scaffold, or step back. **Students** take up agentic opportunities by taking initiative, pursuing their own ideas, organizing their workflow, making collective decisions, seeking help when needed, and selectively integrating feedback.
Teachers as Experts ↔ Teachers as Co-Learners	Professional expertise, accountability, and responsibility for learning quality need to coexist with openness to uncertainty, students agentic/ more self-directed engagement, and willingness to learn alongside/from students	**Teachers** position themselves flexibly in relation to students and enact expertise differently by moving away from a primarily explanatory role, creating conditions for students to become experts, tolerating uncertainty and possible failure, selectively intervening or stepping back, learning from students, and reflecting on their own professional role.
AI-enabled Possibilities ↔ Human Authorship	AI-supported ideation and production need to coexist with students' own thinking, cognitive engagement, meaningful human contribution, and continued authorship of the emerging outcome.	**Teachers** model purposeful AI use and design learning settings in which meaningful human contribution and co-agency remain necessary. **Students** use AI as a support for ideation, creative development, and production, while evaluating its appropriateness in relation to whether the emerging outcome still feels jointly authored.

Limitations

This study is exploratory and based on a limited number of participants. The findings are therefore not generalisable. The analysis draws primarily on retrospective interview data, which may be shaped by social desirability or selective recall. Furthermore, the present paper focuses on one case. Other tensions and dynamics, particularly those observable in interactional data or other cases, warrant further analysis.

Future Research

Several avenues for future research emerge from the findings.

First, a more fine-grained analysis of adaptive teacher guidance is needed. Examining how different forms of professional intervention support or constrain student agency and ownership could contribute to a clearer conceptualisation of adaptive, autonomy-supportive guidance within co-creative learning settings.

Second, the strong emphasis students placed on experienced freedom calls for a deeper cross-case analysis of how agentic opportunities are enacted and perceived. Future studies should investigate how agentic opportunities within learning designs contribute to the development of individual ownership, collective ownership, and agency.

Third, the role of ownership in relation to AI use deserves closer attention. The data suggest that perceived ownership may function as a protective factor against cognitive outsourcing or offloading. Understanding how students negotiate authorship and originality when AI tools are available could provide important insights into human–AI co-creation.

Finally, future research could aim to develop a process model of co-creation in learning. Such a model could contribute to a more systematic understanding of enabling conditions for co-creative learning across diverse educational settings.

ACKNOWLEDGEMENTS

The author would like to sincerely thank the participating students and teachers for generously sharing their perspectives and experiences.

This research project was financially supported by the Deutsche Telekom Stiftung and the Robert Bosch Stiftung. Their support is gratefully acknowledged.

For data processing, the GDPR-compliant AI functionalities integrated in MAXQDA were used to support the translation of interview segments. Claude Design was used to create visualisations. DeepL and ChatGPT were employed for language editing, translation support, and editorial refinement of this

manuscript. All analytical interpretations and final decisions remain the responsibility of the author.

CONFLICTS OF INTEREST

None to declare.

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