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Inside the black box of scenario design: Tracing the cooperative creation of video-based classroom scenarios

Veronica Granlund, Emma Edstrand, Pernilla Nilsson

Halmstad University, Sweden

Simulation scenarios that bridge theory and practice are not designed in isolation; they require collaboration between practitioners from distinct professional worlds. Yet, the process of bringing diverse expertise together into a coherent representation of practice remains largely invisible in the literature. This paper presents a case narrative of a one-year cooperative design process for creating video-based classroom scenarios for simulated work practice in primary teacher education. Using the conceptual lens of boundary objects, we trace the transformative journey of the scenario script as it travelled across the professional worlds of academia, school, media production, and theatre, culminating in three interactive scenarios of challenging classroom situations. Our case demonstrates how following the script as a boundary object can reveal the messy and creative process of meaningful scenario design, and how iterative boundary crossings are mediated through the interplay between evolving artefacts and people capable of working across professional worlds. As such, our case provides insight into the black box that is scenario design, with implications for collaborative and cooperative educational design in broader contexts.

Keywords: scenario design, boundary objects, educational design, cooperative design, teacher education, video-based simulation

Introduction

Simulations in higher and professional education are often described as a possibility to bridge academic coursework and professional practice (Lehtinen, 2023), with features of both worlds, yet neither fully belonging to nor replicating either. At the centre of many simulations is a scenario that depicts a challenging situation and makes aspects of professional practice visible and explorable for students (Linder & Weissblueth, 2024). Simulation scenarios can be represented in several forms, from text-based cases to real-time, technology-enhanced role-play. In our process of designing simulation scenarios, we focus on branching, video-based scenarios for simulations in teacher education, where student teachers engage with classroom situations through decision points, video responses, and reflective prompts.

Existing research on scenario design, i.e. the design of simulation scenarios, has identified several important characteristics associated with effective scenarios, including alignment with the curriculum and intended learning outcomes (Dieker et al., 2014), approximation of relevant aspects of practice (F. Fischer et al., 2022), and achieving a level of authenticity that learners perceive as credible and meaningful (Levin et al., 2023). The design of scenarios that are simultaneously educationally meaningful, professionally relevant, and experientially authentic suggests the need to integrate multiple forms of expertise. However, considerably little attention has been given to how to achieve desired qualities through collaborative and/or cooperative design processes involving practitioners from diverse professional worlds. Here, we use cooperative design as an overarching term for the distributed and interdependent work towards the common goal of developing scenarios, undertaken across professional groups (Star & Griesemer, 1989), while collaboration refers to the specific activities in which practitioners work closely together on a shared task (Kvan, 2000).

In this paper, we present a case narrative of a cooperative design process for creating video-based classroom scenarios for simulated work practice in a primary teacher education program in Sweden. The case draws on project documentation, design artefacts, and reflective accounts from a learning designer to provide a process-oriented account of a design process involving multiple groups of practitioners, using the conceptual

lens of boundary objects (Star & Griesemer, 1989) to highlight the role of mediating artefacts in the boundary-crossing work of creating scenarios as shared representations of practice.

Boundary objects as cooperative mediators

Boundary objects are abstract or concrete artefacts that coordinate work between distinct professional or social worlds by being flexible enough to meet the needs of each world while still robust enough to maintain a consistent identity across boundaries (Star & Griesemer, 1989). Because of their plasticity, boundary objects have the ability to "sit in the middle" of actors with divergent viewpoints (Star & Griesemer, 1989), acting as a means of translation and promoting a diversity of perspectives while aligning voices and visions towards a shared representation of a solution to a problem, thereby encouraging shared ownership of both process and product (G. Fischer, 2013). For example, Star and Griesemer (1989) illustrate the boundary object concept by describing how animal specimens and their associated records served different purposes while coordinating work across the diverse social worlds involved in the development of a natural history museum. However, boundary objects do not facilitate collaboration across boundaries on their own; rather, the realisation of their potential depends on how they are used in practice (Engeström et al., 1995).

In what follows, we draw on the conceptualisation of the scenario script as a boundary object that, through the interpretive work of the learning designer, coordinated the cooperation between academia, school, media production, and theatre in the development of three video-based classroom scenarios. As such, the script becomes a lens for exploring and making visible the often-invisible work of translating different forms of expertise into a coherent representation of practice. The script in this case is not necessarily a written document; rather, it is an evolving representation of the scenario, presented in different forms, that can be interpreted, adapted, advanced, and enacted. The identity of the script as an emerging scenario remained constant, but its use and representation changed across groups and along the process.

Case narrative

The case forms part of a larger design-based research project exploring digital simulations in early primary teacher education in Sweden. The design process spanned one year and involved one teacher educator, three in-service teachers, two production teams, child actors, and one learning designer coordinating the distributed work across professional worlds. We trace how the scenario script evolved across these professional worlds through three phases of transformation and boundary crossing (Figure 1). While the film set involved direct collaboration among production team and actors, most of the design process was carried out through distributed and asynchronous cooperative work.

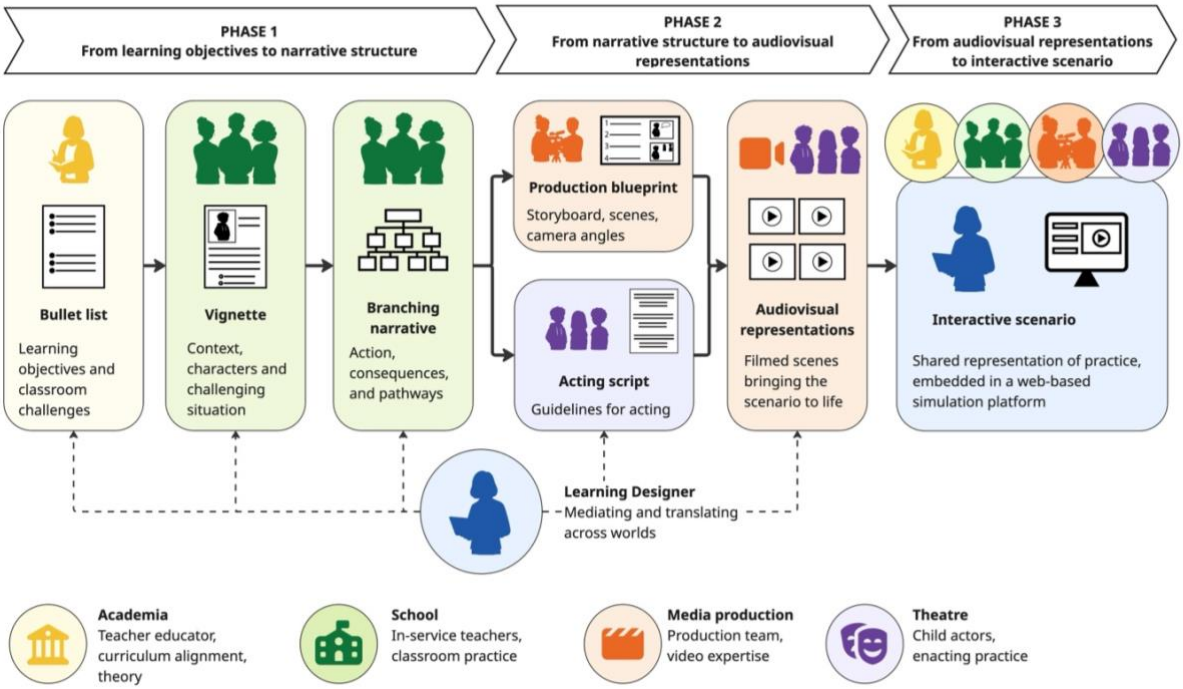


Figure 1. The scenario script's transformative journey across professional borders during the design process.

Phase 1: From learning objectives to narrative structure

The first phase included designing the learning activity and anchoring the scenarios in academic requirements and professional reality. Iterative work with the teacher educator for the courses in which the simulations were to be implemented was crucial for exploring and defining how simulation activities could contribute to student teachers' learning and integrate relevant course content. The initial meeting with the educator included a needs assessment, where discussions revolved around how simulations could support first-year student teachers' transition from students to teachers. Rather than defining specific classroom situations to be simulated, the educator articulated learning objectives relevant to the courses and common classroom management challenges related to specific course content. These pedagogical intentions, noted down as a bullet list, formed the first representation of the scenario script as a boundary object, which was then carried across the boundary from academia to the professional world of primary school teaching.

Three experienced in-service teachers were invited to a total of nine workshops to create narratives that would ensure that the scenarios were not only academically relevant but also realistic representations of the teaching profession. The bullet list of pedagogical intentions was used as a starting point for the teachers' initial structured brainstorming sessions facilitated by the learning designer. The teachers were encouraged to draw on their professional experiences and expertise to outline three common but challenging classroom situations. In their discussions, they oscillated between memories of specific situations and general understandings of strategies for handling different kinds of situations, connecting their reflections to both practice and theories of teaching and learning. Through the active support of the learning designer, the first narrative outline of the scenario was represented as a vignette with background information about the context and key characters, and a description of the challenging situation. The vignette, acting as a transformed version of the initial boundary object, was reviewed by the educator as a tangible representation of both a real-world teaching challenge and a learning activity in development. The educator reinforced the connection to selected course content, such as conceptualisation of leadership styles and pedagogical strategies, which the teachers then integrated into their continued work on the narrative.

In subsequent workshops with the teachers, the goal was to develop the narrative structure of the scenarios, based on the vignettes. The teachers discussed and collaboratively reflected on how to handle each situation and what consequences could emerge from different actions, taking into consideration the theoretical framing

provided by the educator. Their work resulted in a narrative arc, starting with the initial situation outlined in the vignette and branching into different actions and consequences until the situation would be resolved. The learning designer translated their work into a branching narrative flowchart to visually illustrate the scenario structure. By the end of phase 1, the script as a boundary object had crossed the boundaries between academia and school several times, and transformed from a pedagogical artefact as a list of intentions; through a first outline of a vignette into a representation of the scenario in the form of a branching flowchart that made the experience-based and theory-infused representation of classroom practice visible.

Phase 2: From narrative structure to audiovisual representations

The creation of audiovisual representations of the scenarios required the script to cross a new boundary: from the distinct but interconnected professional worlds of school and academia to the world of media production. Thus, the script had to be transformed yet again, to support the distributed work in pre-production and the real-time collaboration on set.

Two production teams were involved in the design process, each comprising students from a media and communication science program at the same Swedish university. The production teams were responsible for capturing audio and video during filming of the scenario scenes and editing the material post-filming. This meant that the script, in order to maintain its role as a boundary object, had to be translated into another professional language to be accessible to the production team in their work. Thus, the text-based branching flowchart was transformed into a production blueprint, including a visual storyboard and detailed filming scripts, that enabled the production team to plan and organise the filming, while the scenario maintained the identity developed by the teachers and educator. While the production scripts met the production team's needs, the format needed to be adjusted for the child actors playing the roles of pupils. The learning designer therefore translated the content into an acting script, containing each character’s spoken lines, as well as cues on emotions and body language. These instructions were based on the narrative script produced by the teachers, written from their perspective as leaders in the classroom, responding to pupils’ actions and reactions. To capture the pupils’ perspective and make the video clips feel realistic, the child actors were encouraged to “own” the script by interpreting the instructions and enacting them as they would in a real situation. The script thus served as a guide rather than a strict set of instructions, and the children embraced the opportunity to, in their view, “act normal” rather than as scripted characters.

The production blueprint and acting script, as two versions of the same boundary object, were brought to the film set, which was the only synchronous collaboration of practitioners from different worlds during the whole design process. The filming took place in a staged classroom together with groups of child actors from a local theatre school. On the film set, the script played the most immediate mediating role, existing simultaneously as an acting script, guiding the actors to enact the narrative, and a production script, supporting the production team as they captured the enacted scenes. At the same time, both versions of the script served as a coordination device for the learning designer, who, at the time of filming, held the role of director and ensured coherence between versions. In this moment, the script’s role as a boundary object became most evident, as it coordinated the work of different groups of practitioners in real time, adapting to each group’s needs while maintaining its shared identity as a video-based scenario in the making. In this phase, the script transformed from an experience-based and theory-informed text-based representation of a branching narrative into a collection of enacted audiovisual scenes depicting a classroom situation. At the end of phase 2, the production script continued to have an important role as an organising device when the production team edited the recorded material and packaged it for the final phase of transforming the script into an interactive representation of classroom practice.

Phase 3: From audiovisual representation to interactive scenario

In the final phase, the recorded material was embedded into a web-based simulation platform using the branching structure developed during earlier phases as a guide. This process aimed to integrate all contributions and voices into one coherent representation of practice: an interactive video scenario, which was subsequently shared with all involved groups. As the script had, at this point, undergone several interpretations since the original narrative was created, the teachers and the educator were encouraged to

review the resulting scenario and adjust aspects that, when brought to life through video and interactive features, no longer appeared realistic, relevant, or appropriate. While the actors and production team carried a sense of ownership through their visible creative contributions, the scenario review served as an opportunity for teachers and educators to reclaim ownership and ensure that the final design still reflected their original vision. At the end of this phase, the script had completed its transformative journey through repeated boundary crossings, from a list of learning objectives and classroom management challenges to an interactive, branching video scenario. Through the mediating and translational work of the learning designer, the script as a boundary object evolved into a shared representation of classroom practice shaped by the distinct expertise of four professional worlds.

Discussion

Existing guidelines for scenario design identify important characteristics such as curriculum alignment, approximation of practice, and authenticity (F. Fischer et al., 2022; Levin et al., 2023); however, they offer little insight into how these principles are achieved in the actual design process. Our case illustrates how scenario design can bring together multiple forms of expertise to achieve desired qualities, and what this process entails in practice. Exploring the scenario design process through the lens of the scenario script as a boundary object revealed both how the contributions from each professional world were translated and how the script was transformed towards a coherent representation of practice, and the role of the learning designer in making these translations and transformations possible. Indeed, tracing the journey of the script as it travelled between groups of practitioners, who rarely worked together synchronously, illustrates a messy yet creative process of sharing knowledge across boundaries of professional practice and different representational languages. To make cooperation and distributed work possible, the script maintained a common identity, that of an emerging scenario, while remaining flexible enough to support the work needed for each group to enrich the scenario with their distinct practical and epistemic contribution (Star & Griesemer, 1989); it became a theory-infused vignette for teachers, a storyboard for the production team, an acting guide for the child actors, and so on.

However, the script as a boundary object did not coordinate collaboration and cooperation on its own. As Engeström et al. (1995) argued, the potential of boundary objects depends on how they are used in practice, and in the case of the script, it required human mediation at every boundary crossing. The learning designer's active work of compiling and interpreting diverse contributions transformed passive forms of the script into translation devices, capable of coordinating and evolving with the design process. For this to happen, the learning designer needed to move with the script, repeatedly crossing boundaries and adapting to the needs, perspectives, and practices of each professional world. The case narrative outlined in this paper demonstrates that the learning designer's role, as a translator and boundary-crossing agent, was not only about coordinating distributed work, but also about genuinely adapting to and inhabiting multiple professional perspectives simultaneously. The script became the vessel that made that happen and allowed each group of practitioners to recognise their contribution and share the ownership of both the process and the final design.

Conclusion

This paper has opened one part of the black box of simulation scenario design by making visible the messy, cooperative, and creative process of bringing diverse expertise together into a coherent representation of practice. By tracing the transformative journey of the scenario script as a boundary object that blends pedagogy, storytelling, and technology, we have demonstrated that meaningful scenario design is not an isolated process but a series of boundary crossings that require both appropriate mediating artefacts and the human capacity to work across professional worlds. While our case draws on the creation of simulation scenarios for teacher education, the implications apply to the broader context of educational design. This case narrative invites learning designers and educators to reflect on which tools and artefacts could support their collaborative and cooperative design processes, and to approach the complexity and messiness of that work not as an obstacle, but as a necessary, productive, and rewarding condition for creating learning environments that bridge theory and practice.

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