

Designing a Tinkering Workshop: Empowering Teachers Demystifying the Design Process

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Abstract. This work aims to guide educational communities in creating tinkering workshops from scratch. Such a process demystifies and makes the design of these workshops accessible, positioning teachers as the true owners of the initiative. If we consider tinkering workshops not as isolated events but as venues to provoke, amplify, and potentially address children's inquiries about science, it becomes crucial for teachers to independently plan this enriching and engaging moment as a community of educators. We developed the RAPA design cycle and tested it end to end, working with a heterogeneous group of designers.

The Design Cycle of a Tinkering Workshop: A Sustainable Approach for Primary Schools

The design of a tinkering activity presents a unique opportunity to demystify the often-intimidating design process and empowers communities to create their own workshops.

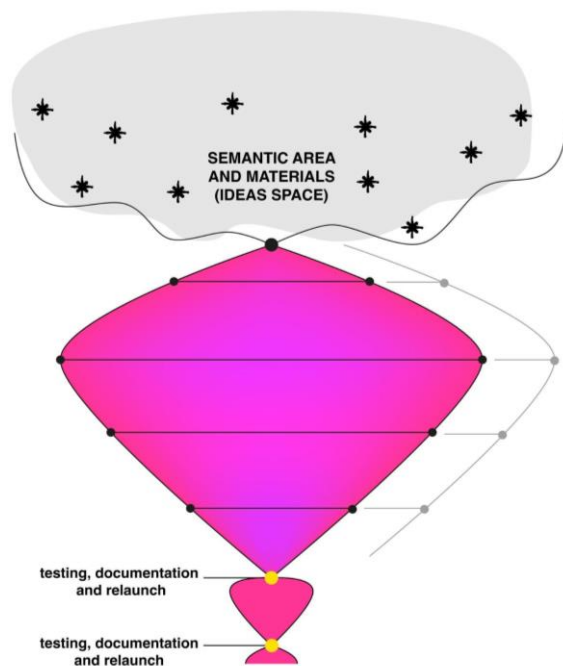
Tinkering, an approach that combines aspects of play, experimentation, artistic expression and science, encourages participants to engage deeply with materials, tools, and concepts, fostering an environment of exploration and creative problem-solving [1,2,3,4,5]. In our experience, the more processes are co-designed and participatory, the more teachers feel ownership over the process. As a result, they are ultimately better equipped to structure meaningful and authentic pathways. This process is undoubtedly fundamental when tinkering workshops are a moment of opening aimed at nurturing and advancing disciplinary questions related to science, particularly to physics [6,7].

Upon recognising the absence of a structured tinkering design framework in the literature, we hypothesised that this gap represented a significant barrier to the co-construction of such workshops, particularly by educators. Following an interview with a professional from the Tinkering Studio, we deliberated on crucial points that could serve as a foundation for our design work.

With this perspective, we identified the essential components of our design process:

- **Iterative:** Inspired by the concept of the learning spiral [4], we envisioned an iterative process.
- **Collaborative:** We valued the hybridisation of diverse ideas and perspectives from a heterogeneous group, sharing a common vision for the learning process. We believe this approach can be effectively applied within a cohesive educational team.
- **Enjoyable:** We are convinced that the most compelling ideas emerge in a playful, relaxed atmosphere. We aimed for the design sessions to be engaging, light-hearted, open, informal, and creative. We hope that teachers can embrace these sessions with the same spirit.

- Ownership and Engagement: The focus of the activity should emerge from the working group.
- Leisurely Pace: It is essential to allow ample time for play, experimentation, and generating a multitude of ideas, possibly integrating them, as well as sufficient time to select and devise a testable setup.
- Testing and Relaunch: We considered it essential to incorporate various testing phases with children and reflections on potential enhancements into the iteration cycle. Completing multiple iterations is necessary to polish the workshop.



Inspired by these insights, we endeavoured to construct a scheme for our design process that aligns with our educational philosophy, positing that the design journey itself could serve as an enriching and developmental experience for educators. So, we embarked on creating a process design, henceforth referred to as the RAPA design. The name initially stems from the visual shape of the design schema. Still, it can whimsically stand for "Reiterative Agenda for Participatory Adventures". The outline of the developed design schema is in the picture.

We expect RAPA to be a guideline for designing a tinkering workshop by a community of educators. To test this idea, we validated the complete cycle of experimentation with a heterogeneous group of designers (educators/scientists/teachers/artists) from ideas/semantics to a final workshop. Finally, we tested the breadboard workshop "sound carousel"

with two groups of (6 to 9) children in the preprimary school. We collected and analysed audio-video documentation and completed a successful first iteration of the RAPA process.

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