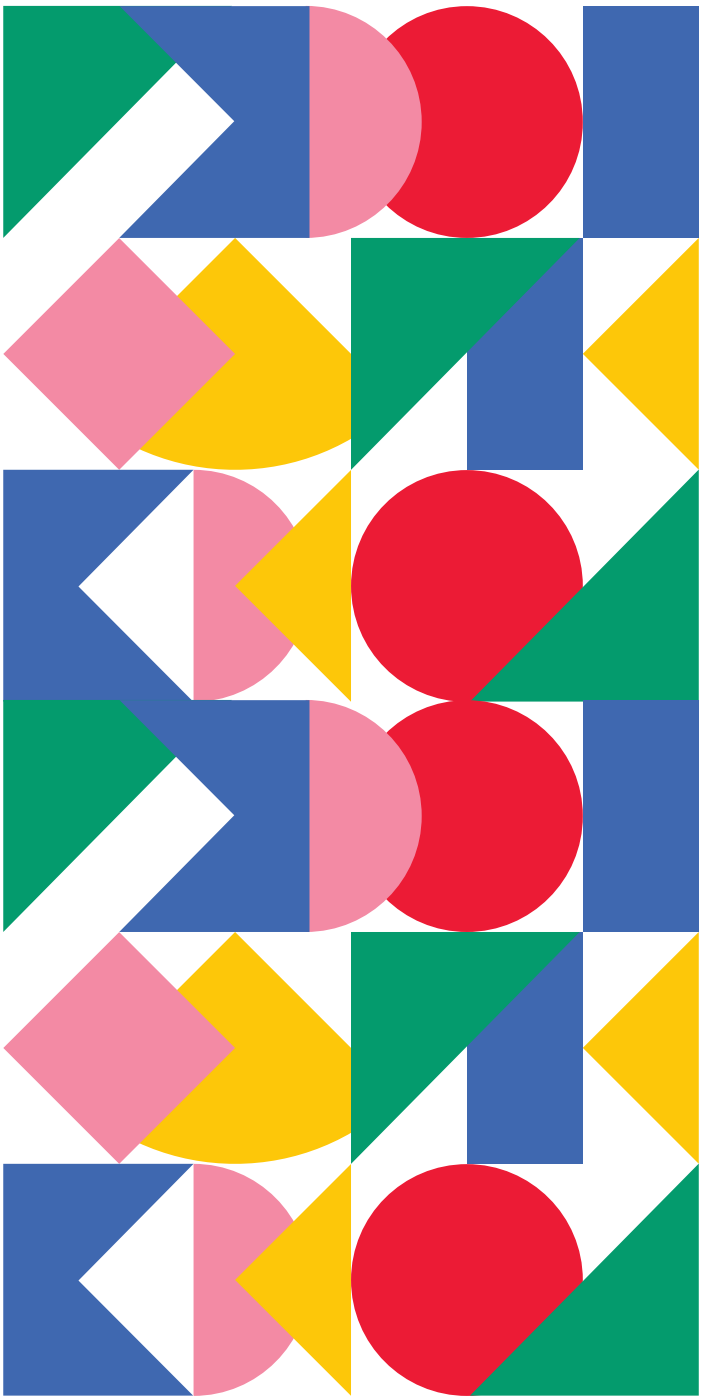

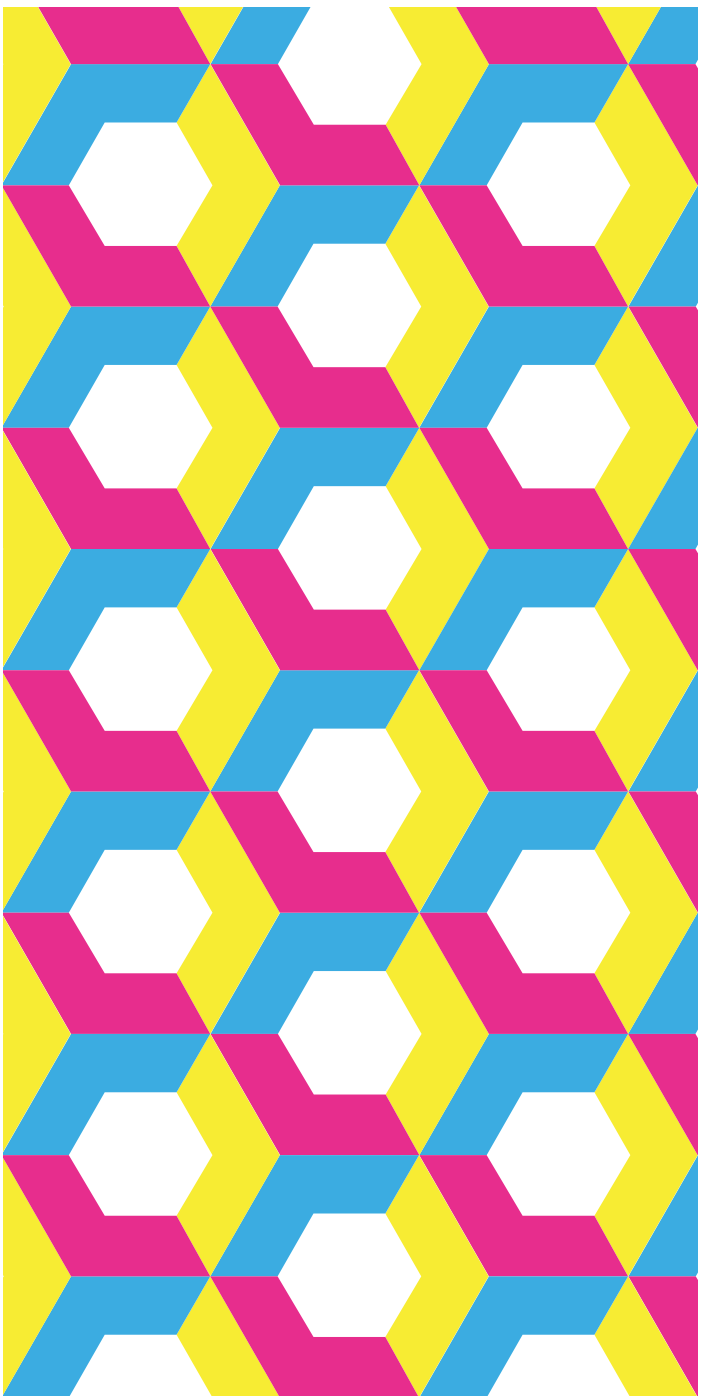

# PROCEEDINGS OF CONSTRUCTIONISM / FABLEARN 2023

Edited by
Nathan Holbert &
Paulo Blikstein

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Proceedings of Constructionism / FabLearn 2023

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# Visible learnings

*Shared digital tools for a Kindergarten investigation*

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## Abstract

After the intense use of remote learning technology during the Covid-19 pandemic, this short paper presents a case study about integrating technology into face-to-face project-based learning. Conducted with a kindergarten class in Sao Paulo, Brazil, this research explores how children adopted digital tools as technologies to think with and how those tools enabled the unusual, collaborative construction of documentation in ways that likely would not have been possible without them. Specifically, digital documentation expanded the possibilities for data gathering and presentation, created new avenues for constructing collaborative knowledge, and afforded opportunities for children and adults to co-author the project artifacts. These technologies enhanced the in-person work of learning about space and place in ways that were clearly and necessarily mediated by teachers. Implications for kindergarten teaching and learning include the extension of and reflection on collaborative, project-based work.

## Introduction

The Covid-19 pandemic revived decades-old discussions about the importance of digital technologies as extensions of the human mind (Papert, 1980; 1993) rather than a tool to replace teachers. One way technology can support face-to-face teaching is as a documentation tool. By continuously students' investigations through various media and supporting the creation of narratives about their experiences, documentation makes learning visible and allows for collaborative reflection (Rinaldi, 2021). These records, shared with peers, teachers, and other members of the community, facilitate the exchange of ideas, where feedback enriches the learning process and promotes a culture of collaborative and reflective learning (Bereiter & Scardamalia, 2014). Documentation also allows students to develop essential skills of observation, critical reflection, argumentation, creativity, communication, self-regulation, and metacognition (Papert, 1980; Martinez & Stager, 2013; Rinaldi, 2021). Metacognitive reflection, in turn, helps students improve their learning practice (Lai, 2011) and generalize their knowledge and skills to other areas, becoming more independent and effective learners (Zimmerman, 2000).

This case study focuses on the impacts of technology used by children and educators to develop and document a project about school spaces. Two teachers and a documentation educator (co-authors of this paper) designed a study to introduce and test the contribution of digital tools for documenting group work in their kindergarten classrooms. Records made at each step of the project served as the starting point for subsequent steps. The teachers analyzed this documentation, aiming to answer the following research questions: (i) how do children adopt digital documentation tools as objects to think with? (ii) in what ways these tools enable collaborative documentation construction?

## Methods

### Participants

This case study was conducted from March to July 2022 in a private school in São Paulo, Brazil, committed to constructivism and Reggio Emilia pedagogies. Documentation is a central part of educational work Reggio Emilia schools, allowing children to create, design, experiment, explore, and constantly reflect on their practice (Resnick, 2007). The project's two teachers, who each have post-graduate degrees and over a decade of teaching experience, were studying how to incorporate digital tools in the kindergarten classroom to support students' exploration and learning. A documentation educator, who had 12 years of classroom experience and 6 years as the school-appointed documentation expert, collaborated with teachers to plan and analyze data of their classroom work. The teachers and documenter analyzed artifacts (e.g., notes, photographs, 10 hours of video, and 12 hours of audio recordings) produced during a project with one classroom of 18 five-year-old children. In weekly meetings, the teachers and documenter created a Sway board (web application) where they were able to share their reflections and design interventions.

### Project Design

To support their students in developing key geometry and humanities skills, the classroom teachers designed a project in which students explored and generated inquiries about different spaces in their school (e.g., stairwells, classrooms, a storage space). The kindergarten geometry curriculum expects learners to understand reference points, interpret and construct spatial representations, discern sizes and proportions, and communicate positions and displacements. The humanities curriculum includes the notion of place as occupied by various people, serving certain functions, and carrying a sense of belonging. Learners are expected to understand that affective relationships, and ultimately intimate connections, form in these spaces (Brasil, 2018). To move across and become familiar with various target spaces in their schools, children participated in various on-site activities –talking with people there, building a digital map, creating a model with blocks, etc. 2 or 3 times a week for four months. According to Reggio Emilia's philosophy, the design of the activities happens during the project and in dialogue with the documentation in an investigation cycle. Prior planning of activities, preparation, execution, intervention, observation, recording, and listening to hypotheses and questions from children, as well as learning and discoveries, returning to the beginning of the pedagogical documentation cycle.

When planning the activities register, the educators based their choice of modality – i.e., recording video, audio, or still images – on their communication goals, placing static photography collages on classroom walls and using video recordings to analyze students' speech and movements. Children's maps, models, and other representations were also displayed in a Sway, which allowed teachers and students to revisit and modify these images, audio, video, and text during group reflections. These materials made it possible to design a sequence of activities driven by the students learning inquires. They were also curated and organized to be shared with other educators and students' families, primarily by posting printed materials on the classroom's outside wall.

## Implementation

To begin the project, the educators invited their students to explore the different environments of the school, including a stairwell, unfamiliar classrooms, and a storage space. Two groups, each led by a teacher, walked through the spaces,

and poses questions such as: What is this place? Who works here? What do other kids do here? Proposing these questions helped identify children's interests in and about these areas. Next, students explored the school's floor plan on paper (Figure 1, top left) and using ThingLink, they created drawings of the different spaces. ThingLink allowed children to interact with different types of media (e.g., photo, video, audio) overlaid onto the school floorplan, expanding the means through which they could appreciate spaces' functionalities and uses (Figure 1, top right). Then, children modeled the school using large wood blocks and cardboard tubing (Figure 1, bottom left). A ceiling-mounted GoPro camera recorded children's actions, allowing educators and students to analyze their movements from a top view. As a final product, students and their teachers constructed a new ThingLink map of their school with novel photos and audio narrations. Through these activities, groups shared their discoveries and learnings in different modalities: individual drawings, collective maps, and construction with wooden blocks.

*Figure 1: (clockwise) Consultation of the floor plan; collective construction of the school ThingLink map; 3D modeling the school with blocks; sharing posted documentation with families.*

As students created narratives about spaces in their school (e.g., a stairwell and storage room), one group suggested there was a witch and started to search for her. They planned to locate her using the teachers' cellphones to film and take photos. In talks with the educators, students identified, validated, and shared knowledge about technology, such as "Can we watch the video in slow motion?", "Have you uploaded the video from your phone? Can we watch it on the computer?", "It is better to take a photo because the video is too big!". The choice of the tool by the students demonstrated how much they learned, in previous stages, about the different school spaces and technological affordances they could use to solve their investigation.

These audio recordings children created for their final ThingLink map also evidenced their newfound familiarity with their school environment. During the map's development, students requested that certain spaces be photographed or

filmed for extended periods and proposed using ThingLink for the final documentation instead of more familiar paper records.

Continued interaction around the documentation – such as circles of conversations, appreciation, reflection, and debriefing – enabled children to navigate the new school environment, propose continuations for their research, and present their findings to family members (Figure 1, bottom right). They infused each space with individualized meaning, familiarized themselves with the people who worked there, and gained insight into the habitual uses of various spaces and the potential for creating new ways of using them. The children demonstrated problem-solving abilities by suggesting using slow-motion footage to recover details that were overlooked. They clearly indicated the routes necessary for moving from one space to another using reference points and communicating positions. They identified places that needed to be photographed and creating detailed maps and constructions (representations). Moreover, they demonstrated autonomy in school space, checking the day's snack on the blackboard and requesting specific games from Pedagogical Support.

## Conclusion

The project highlighted an example of an object to think with for using digital tools during in-person, collaborative, and constructionist learning. The research sought to answer two initial questions: (i) how children adopted the digital tools as objects to think with and (ii) how those tools enabled the collaborative documentation.

Regarding the first question, the children suggested techniques to gather data in their search for the witch, justifying their choices based on knowledge about the different media. Digital tools (e.g., Sway, ThingLink) complemented their analog experiences (e.g., blocks, draws maps), making it possible for children to reflect on the school spaces and produce an interactive map. As in Reggio Emilia, we see the possibility for students to document with their teachers and create publicly shareable products, such as in Constructionism. Addressing the second question, the digital tools enabled the collective construction of artifacts supporting collective reflection and revision. The technologies enhance the in-person work of learning about space and place, but clearly and necessarily mediated by the teachers. Documentation allowed children to create narratives of their experiences collaboratively and reflectively (Bereiter & Scardamalia, 2014). The digital tools mobilized the children, extending the possibilities to structure and generalize their learning while recording and discussing in groups.

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## References

Brasil. (2018). Ministério da Educação. *Base Nacional Comum Curricular*. Brasília: Author.

Bereiter C. & Scardamalia, M. (2014). Knowledge building and knowledge creation: one concept, two hills to climb. In B. J. Zimmerman & D. H. Schunk (Eds.), Handbook of Self-Regulation of Learning and Performance (pp. 85-97). Routledge.

Lai, E. R. (2011). Metacognition: A literature review. Always learning: Pearson research report, 24, 1-40.

Martinez, S. L. & Stager, G. (2013). Invent to learn: Making, tinkering, and engineering in the classroom. Constructing Modern Knowledge Press.

Papert, S. (1980). Mindstorms: computers, children, and powerful ideas. Basic Books.

Papert, S. (1993). The children's machine: Rethinking school in the age of the computer. Basic Books.

Resnick, M. (2007). All I really need to know (about creative thinking) I learned (by studying how children learn) in kindergarten. In Proceedings of the 6th ACM SIGCHI conference on Creativity & Cognition (pp. 1-6). ACM.

Rinaldi, C. (2021). *In dialogue with Reggio Emilia: Listening, researching and learning*. Routledge.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 13–39). Academic Press.