

# Circles of Inventions

Paola Salmona Ricci  
Avenues The World School SP /  
Instituto Catalisador  
São Paulo/SP  
Brazil  
www.catalisador.org.br  
paola@catalisador.org.br

Simone Kubric Lederman  
Instituto Catalisador  
São Paulo/SP  
Brazil  
www.catalisador.org.br  
simone@catalisador.org.br

Rita Junqueira de Camargo  
Instituto Catalisador  
São Paulo/SP,  
Brazil  
www.catalisador.org.br  
rita@catalisador.org.br

## ABSTRACT

The Program "Rodas de Invenções" (Circles of Inventions - CoI), an initiative by the Brazilian non-profit [Instituto Catalisador](http://www.catalisador.org.br), began as a constructionist activity in public libraries in Brazil where, after reading sessions, children engaged in the creation of meaningful personal narratives through the construction of artifacts to be played with and shared. Today, the program has evolved to include diverse non-formal educational spaces as well as schools. In a world with growing social and environmental challenges, the framework and Catalyst Kit developed for Circles of Inventions allows for a maker-centered learning practice that fosters the thinking and sharing of narratives, ideas and 3 dimensional drafts related to local and global issues, in a culturally responsive, purposeful, meaningful and personal way, while also connecting students from different backgrounds in public space. The audience who has participated in CoI in the last three years has been diverse and has included Kindergarteners, primary and secondary school students, educators, school leaders and administrators, librarians and others. The CoI framework and the program as a whole draws significant inspiration from the Project Zero Agency by Design framework, from Mitchel Resnick's Creative Learning pillars: Projects, Peers, Passion and Play, and from the concept of Educating Cities.

## Keywords

"Rodas de Invenções"; "Circles of Invention"; "Educating City"; "Instituto Catalisador"; "Creative Learning Practices", "Maker-Centered Learning"

## 2. DESCRIPTION

### 2.1 Program Rodas de Invenções

Instituto Catalisador is a Brazilian non-profit organization that has as a mission to affect a significant number of educators and learners, who, through creative learning experiences may become authors of their own paths and agents of individual and social change. In our work at the Instituto Catalisador we are particularly interested in designing and implementing maker-centered learning projects that engage people and school communities, in genuinely meaningful educational practices, that require a playful problem solving attitude. The Institute's projects promote the convergence of diverse languages creating possible links between local culture, science, technology, the arts and fostering student agency. Constructionism, Creative Learning, Educating Cities, STEAM, Inclusion as well as the Agency-By-Design Project Zero framework are the main conductive threads and theoretical pillars that sustain and guide our work.

The Program Circles of Inventions started three years ago and, since then, a diverse group of learners has participated. For this paper, we will focus on four different groups who have been involved in the CoI Program in 2018 as they are representative of how the program is at present and help illustrate the CoI framework. **Group 1** was composed of 6th to 8th grade students from a non-formal educational after school space (Centro da Criança e do Adolescente Santa Catarina) who use to go to a community place called Mirante Cultural, a cultural haven that is always and freely open to everyone, specially for the children from public schools who study or live nearby in this socially vulnerable region, located in Pirituba, São Paulo. In this group, the Instituto Catalisador team partnered with the organization and facilitated a cycle of 4 CoI at the Mirante.

**Group 2** was made up of two subgroups: 8th -10th grade students from a private international school, Avenues São Paulo and 5th and 4th grade students from the CCA (Center for Children and Adolescents) that caters to the community of Jd. Panorama, just beside Avenues. The Avenues students began a club ("The Pracinha Club") to work together with primary students and the Design Thinking teacher (who is also an educator at Instituto Catalisador) in a project to transform two local green spaces near the school into more welcoming, safe and playable spaces for all the children in the neighbourhood. One of the goals of this "Pracinha" project at Avenues is to create more possibilities for authentic interactions between children from different backgrounds in public space. As part of this project, the "Pracinha Club" students learned from their Design Thinking teacher about the CoI and used the framework and the Catalyst Kit for CoI to organize and facilitate a workshop for 4th and 5th grade students from the CCA. The goal was to connect with the children from the neighbouring community, invite them to the "Pracinha" project and learn about their hopes and dreams for these local squares using a CoI.

**Group 3** Primary Division students at Avenues São Paulo, during Design Thinking class, who have been going through different CoI to think with their fingers about issues related to the city, the neighbourhood and more specifically the interventions that may happen in the two green spaces near the school to make them more welcoming, safe and playable.

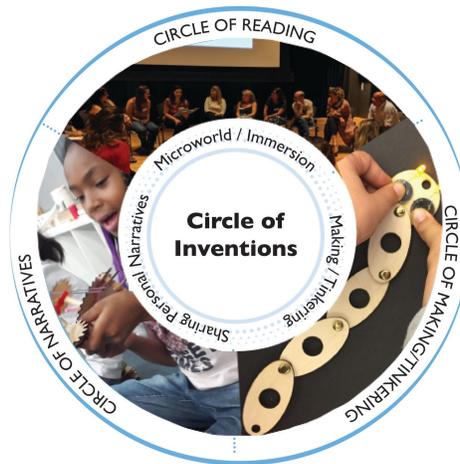
**Group 4** are educators from both private and public schools who have participated in CoI workshops, during the First Brazilian Creative Learning Conference and during an OpenEd event at Avenues São Paulo. These workshops were to introduce the Circles of Inventions

Program, invite educators to use the framework as well as re-think and re-design the physical kit, according to their educational and cultural contexts.

## 2.2 Description of the educational experience

The desire to make the Circles of Invention program more widespread and sustainable lead the Instituto Catalisador team to, in 2017, begin developing a Catalyst Kit for CoI, which include a framework, website, social media forum, and physical kit of materials that have as a criteria low-cost, reusability, easy replaceability, durability and that, together with repurposed things and clean scraps, may allow for interesting creations, play and new thinking trajectories. To test the framework and the physical kit, in 2018 we organized a series of CoI with different groups - in a non-formal educational setting, as a school project, and as a workshop for educators. We collected observations and feedback, tweaked the program, remixed the kit with educator and student suggestions and now intend, in 2019, to further spread the initiative around Brazil. Participating in FabLearn 2019 is a part of this goal. The Circle of Inventions Framework which was used in all CoI in 2018, was designed after a careful look at many CoI that happened. The theoretical pillars behind it are also the conductive threads of most of our work at Instituto Catalisador: Constructionism, Creative Learning, Educating Cities, and the Project Zero Agency-By-Design framework. The Circles of Invention are made up of three distinct moments, a Circle of Reading, a Circle of Making/Tinkering, and a Circle of Narratives.

[Figure 1 - Circle of Inventions Framework \(image is linked to larger figure for visualization\)](#)



In the **Circle of Reading**, the story functions as an immersion into a common territory of meanings (words and images) which could be interpreted as a “microworld” to foster tinkering. Here, we refer to “microworld” from Eisenberg’s interpretation of Papert’s microworlds in the article Mindstuff. “A microworld, then, can be interpreted as a safe intellectual haven – a cognitive space in which ideas can be explored independent of the complications of such things as arbitrary rational numbers, friction and playground politics.” (Eisenberg 2003 p. 39). The choice of books, in this context, to create an intentional “microworld” is very relevant to the goal of the CoI. While thinking about developing agency in students and getting them engaged with real world issues concerning growing social and environmental challenges, for example, we have chosen for a series of CoI the book “The Curious Garden” by Peter Brown, where children are provoked to think about their cities, nature, pollution, and how each one can play a part in creating more inclusive, sustainable and regenerative futures. In this part of the CoI framework, we borrow from the Agency by Design the thinking routine “Imagine if“, where participants are challenged to begin their Making/Tinkering Circle after imagining in what ways something, curated by the educator and related to the book, could be more **effective**, more **efficient**, more **ethical** and more **beautiful**. (Clapp, 2017)

Seymour Papert’s constructionism paradigm is evident in the educational/learning philosophy of the CoI, as children are invited, in **The Circle of Making/Tinkering** to create and construct meaningful and sharable objects to think with as well as play with. The Circle of Making/Tinkering is not a moment to represent one’s understanding of the story, but to tinker, think with one’s fingers about the questions raised by the educator which must be carefully crafted to spark a possibility of student led inquiry and creative process, individually or collectively. Here, the idea of microworld emerges again as the tinkering itself becomes a microworld for new narratives and possibilities for the themes in question. In this part of the CoI the goal is for participants to create 3 Dimensional drafts of ideas, hopes, dreams or stories, which we see as scaffolds for the construction of new meanings, which ultimately is the goal of this practice. During these CoI we have been using the physical material created and curated for the Catalyst Kit for Circles of Invention by Paola Ricci during the course Tools and Toys for Knowledge Construction at Teachers College, Columbia University. The idea of having wooden pieces that attach to each other in very open ended ways was a way to move away from only using recycled materials and have the possibility of reusability. The criteria of reusability, and having the children undo their productions at the end of the session is also relevant in the process of the participants understanding that what is being built during these circles are not things, but ideas. The idea with CoI in schools as well as in other spaces is also to rethink and remix these pieces using digital fabrication tools. The idea of the physical kit is that it is in constant development with input for the users to make it relevant and culturally sensitive no matter where CoI take place.

**The Circle of Narratives** is a fundamental part of the process where participants have the space and time to share their inventions and stories. New narratives emerge for the issues in question, but also new narratives for the authors of each artifact also surface as they find

space to express themselves, be heard and also listen to peers. These exchanges spark new possibilities for stories, tinkering explorations, feedback, remixes, new ideas, and most importantly new relationships and community building. In these Circle of Narratives we also find opportunities to engage the participants in Project Zero thinking routines such as *See, Think, Wonder, Connect, Extend and Challenge* as well as *Parts, Purposes and Complexities*.

**Group 1 - Cycle of 4 Circles of Inventions at the Mirante, Pirituba, SP** - The experience at the Mirante is a great example of how the CoI Framework may be implemented in school and non-formal educational settings. After establishing a partnership with the Mirante Cultural in Pirituba, São Paulo, throughout November of 2018 a team of 4 educators from Instituto Catalisador met with 3rd to 5th graders who regularly attended the Mirante Cultural after school to run a cycle of Circles of Invention. The goals of the project were to 1. establish a closer relationship with the Catalisador and Mirante teams of educators; 2. Share with the educators of the Mirante the Circle of Inventions Framework and Kit; 3. Instigate the notion of collaborative work amongst the children and experience the concept of participatory creativity(Clapp, 2017) ; 4. Co-create new proposals for the Catalyst Kit for Circles of Invention 5. Collect feedback and suggestions for the CoI program from educators and children and finally; 6. At the end of the process organize and systematize the experience to share with other educators and further replicate the Circles of Invention. Overall the circles were very rich in terms of the creations and new narratives that were born. Students got deeply involved with the themes, the tinkering, with the material, and were surprised by how collaborative work led to outcomes they had never imagined. During the 4 Circles that happened at Mirante the kids listened to stories from books and tinkered with the Catalyst Kit imagining if their surroundings could be different in many ways. To talk about the territory we read the book "Curious Garden" (Peter Brown) and asked them what they want to spread in their daily routes to make them more effective, efficient, ethic or beautiful; to think about the meaning and why we make things we read Lolo Barnabé (Eva Furnari), a Brazilian story about a man who invented many things but was never satisfied, and forgot that the most important thing were relationships; in the 3rd circle we read Wilfrid Gordon McDonald Partridge (Men Fox), to talk about their memories and to reflect about how these may be nurtured by an object. In this Circle of Narratives we used the Thinking Routine Connect/Extend/Challenge to see how the inventions created by their pairs connected to their memories. The 4th CoI was to think about the kit and collect their suggestions for it, so we read "What do you do with an idea" (Kobi Yamada). We prompted the students by saying that the CoI and the Kit started as a small idea that is now being spread around the country, so everyone can be part of it. In this last Circle of this cycle, the students designed and prototyped new pieces for the Catalyst Kit, re-mixing it accordingly to their own repertoires and references. The new kit, including all the new pieces (cut afterwards by the catalyst team) became a part of the educational resources at Mirante Cultural, offering more possibilities for other Creative Learning activities in this space. The framework of the CoI allows for new narratives to emerge as participants engage in Creative Learning Spirals of Imagining, Creating, Playing, Sharing, Reflecting and Re-Imagining. (Resnick, 2017).



Fig. 2. Circle of Reading Mirante, 2018



Fig. 3 Circle of Making, Mirante, 2018



Fig. 4 Circle of Narratives - Mirante 2018

**Group 2 - Circle of Inventions Organized and Facilitated by Avenues “Pracinha” Club students with CCA 4th and 5th graders** - The CoI at Avenues São Paulo were our first experience taking this practice into schools. The CoI were used in two different circumstances: First, to get the Pracinha Club students from 8th -10th grades to ideate interventions for the recently adopted squares and secondly, put them in the shoes of facilitators of CoI as they organized listening and ideation sessions with younger students, from 4th and 5th grades, from the neighbouring community who attend the CCA. The goal of these CoI were twofold, get all the students thinking and constructing meaning with their fingers as they created 3 dimensional drafts of ideas and dreams for the green spaces around the school and, secondly building a bridge between the students at Avenues and the children from the community of Jd. Panorama, which is a community inserted in a context of high social vulnerability. It was remarkable to witness the way in which all the children engaged in the CoI, both as facilitators as well as participants. The prototypes were very elaborate, the narratives engaging and hopeful and the connection that was established between the children from such different contexts clear. As Henrique Oliveira (13), one of the Avenues students put it “I was amazed by their work and their creativity.” During the OpenEd when he shared a bit about the experience he summed up saying “It was AMAZING!”. By the end of the workshop all children were laughing, hugging and arranging a next CoI. All the ideas were recorded for a design challenge for these spaces that will be organized with upper division students.

**Group 3 - CoI with Primary Division Students from Avenues São Paulo** - The Design Thinking teacher for the primary division at Avenues organized a series of CoI with children from Pk to 5th grade with the books “What do you do with an Idea”, “The Most Magnificent Thing”, “The Curious Garden”, and “Maybe Something Beautiful” to get them to think about their city, their neighbourhood, sustainability, empathy, citizenship, amongst other topics. The 3 dimensional drafts that were made as well as the narratives and exchanges that happened with the sharing of these creations have lead to new projects ideas, new questions, as well as an urge, by students, to start really working on the green spaces near the school to truly begin transforming the neighbourhood.

**Group 4 - Circle of Inventions - Workshop with Educators at the First Brazilian Creative Learning Conference and at the Creative Learning and Rodas de Invenções OpenEd at Avenues São Paulo** - Instituto Catalisador organized two workshops for educators using the CoI framework and kit to collect feedback for the program in schools. The first one was during the First Brazilian Creative Learning Conference in Curitiba in September and the other during an OpenEd event at Avenues São Paulo. Educators and school leaders from public and private schools attended and were tremendously engaged in the activity. There were several suggestions for the physical kit that emerged as well as requests for more information and replication of the workshop in their schools and municipalities. Independently from the institute, after the workshops Circles of Invention have been organized in a library in Curitiba, Paraná and at the school Aubrick in São Paulo, S.P..

### 3. CONCLUSION

#### 3.1 Results

The results we observe from these CoI experiences, both with students as well as with educators, are related to not only direct personal learning outcomes but also to new possibilities of encounters, relationships, and action within the territories where these CoI occur. The possibility of thinking about challenging environmental and social issues in a hands-on and even “playful” way during the making/tinkering circles seems to allow for deeper engagement and innovation, as expansive “dream” ideas are supported in these circles. The collaboration, sharing and listening that takes place in both the tinkering and the narrative circles promotes the possibility of developing communication skills as well as fosters participatory creativity and empathy, important aspects in developing the necessary agency for tackling and solving real world social and environmental issues. When organized in non-formal educational spaces such as libraries and cultural centers these activities bring children to these spaces often expanding their learning territory and also promoting new opportunities for authentic encounters with different children. In schools, CoI may also prompt the use of public spaces around the school in different ways, as well as the agency over issues affecting the territories around the schools. Finally, when students in schools organize CoI in public spaces in their school’s territory to connect with other students and/or promote the thinking and discussion of a specific issue, here too, the territory is also being positively impacted with new possibilities for the building of an expanded learning community. The experience of the CoI for us educators who facilitate them is very rewarding, as it is a relatively simple practice to deploy with significant results in terms of learning, playing, bonding and possible social and environmental impact. The physical kit, in its nature, should be constantly changing and improving, specially with the input and creation from kids, the first version, which we have been using, previous to any of these remixes needs more color and more possibilities of structural attachments. Interestingly, these suggestions have already been made by students, and hopefully soon, a new version of the physical pieces will be produced in the makerspace of Avenues by the Pracinha Club students. The broader impact in the community has been seen in the Mirante as we could see children walking around the streets, intentionally going to a incredible community place, enjoying a space that they did not know before, even though it was so close and available to them., at Avenues as numerous ideas to transform the local squares as well as an instrument to connect children from the community and the school and amongst the educators who participated in the workshop as a desire to replicate the practice in their educational contexts.

#### 3.2 Broader Value

The CoI is a feasible practice to introduce into schools that may be considered a "low floor, high ceiling and wide walls" (Resnik, 2016) educational experience, as participants may engage in different levels of complexity with the materials and the thinking. "It's not enough to provide a single path from low floor to high ceiling; we need to provide wide walls so that kids can explore multiple pathways from floor to ceiling."(Resnik, 2016). The CoI practice is essentially a maker-centered/hands-on learning activity that supports project-based learning and may also involve digital fabrication if students are remixing and reinventing the physical kit for Circles of Invention. The key learning we will share is related to how this practice may spark deep discussions and thinking about important issues, no matter the subject, in a way as to also promote the possibility of project development, peer learning, expression of personal passions as well as a playful environment.

#### 3.3 Relevance to Theme

Through the careful curation of books as well as the thoughtful elaboration of questions for the "Imagine If" thinking routine during the Making/Tinkering circle, the theme of growing social and environmental challenges may be directly tackled in a CoI. Furthermore, the nature of the program whereby children are stimulated to interact with other children in public spaces also touches upon social and environmental challenges, as it is through these real and authentic experiences and interactions that students may develop empathy as well as face directly some of these pressing issues. In Brazil, we live a sort of an apartheid of childhoods, and we truly believe that creating opportunities for positive, authentic and creative interactions amongst children from different realities is essential for students to grow more critical as well as resourceful to think and act towards the solutions of growing social and environmental problems.

### 4. BIOS

**Paola Ricci**, is a researcher, educator at Avenues World School SP, and co-creator of Instituto Catalisador, MA student at Teachers College (Columbia University) and specialized in Education and Social Development (Instituto Singularidades).

**Rita J. de Camargo**, is a researcher, educator, and co-creator of Instituto Catalisador, with a Ph.D. in Food Science (Universidade de São Paulo) and specialized in Education and Social Development (Instituto Singularidades).

**Simone K. Lederman** is a researcher, educator, and co-creator of Instituto Catalisador, MA in Educational Psychology (Universidade de São Paulo).

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