

# Multiculturalism and Creativity in Storytelling

## Visual Development of a Digital Manipulative for Young Children

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### ABSTRACT

Here, we present the visual development of a digital manipulative that promotes creative storytelling among young children. The tool addresses multiculturalism, by presenting children with story elements from different cultures. We reflected on how to create visual elements that both represent a given culture and foster the children's imagination and creativity. It is key to create eye-catching and imagination-inducing visuals, that can be achieved through an exploratory and iterative process. It is crucial to undertake extensive research to learn about and understand the history and meanings behind each culture, to avoid stereotypes and other representation clichés. Whenever

possible, it is important to involve people raised in each culture in the design process, since their contribution is grounded in real life experience and will translate into valuable insights.

### Authors Keywords

Visual Development, Multiculturalism, Creative Storytelling, Digital Manipulative.

### INTRODUCTION

This paper presents the visual development of Mobeybou, a digital manipulative that uses physical blocks to manipulate digital content and aims to promote creative multi and cross-cultural storytelling among young children.

Digital manipulatives [1], often also named Tangible User Interfaces [2] are physical representations, materials or objects with embedded computational properties that allow interacting with and manipulating digital content. These tools are especially adequate for young children as they provide opportunities for exploratory physical embodiment (through manipulation) [3], collaboration, verbalization, exchange of ideas and negotiation [4].

The design of Mobeybou is framed by theories of embodied and distributed cognition [5, 6]. The role of sensorimotor action in cognition is well established. E.g., Glenberg

explains that “all psychological processes are influenced by body morphology, sensory systems, motor systems, and emotions” [7:586]. Research has also shown that besides the body, cognition is configured by the use of resources (tools, artefacts, materials) and by our interactions with others. These are external to the individuals but they are connected to their thinking [5, 6]. In the field of education, the role of tools, artefacts or objects can be traced back to visionary pedagogues like Friedrich Fröbel [8] and Maria Montessori [9]. Further, the intimate relation between tools, materials and human cognitive processes is undeniable, as detailed by [10:ix]: “Creativity is a practical as well as a conceptual process: how and what we create has much to do with the tools and materials we have available, and what we make of and with them”.

### STORYTELLING

Storytelling is one of the most powerful tools for children to communicate their creativity, providing opportunities for creative thinking [11], socio emotional development and social interaction [12]. Stories offer children a “nourishing habitat for the growth of cognitive, narrative and social connectivity” [11:8], having the potential to promote children's curiosity about the world as well as their acknowledgement and acceptance of diversity and empathy as they are introduced to unknown characters, to their lives

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and inner motives and feelings [11]. By providing a gateway to the minds of others, their emotions and experiences, stories help children to create their own identity [11]. “storytelling brings to the listeners heightened awareness – a sense of wonder, of mystery, of reverence for life” [13:17].

With Mobeybou children become narrators by doing. The use of blocks implies a natural use of the body, as the children use their hands, but also their eyes and ears, to grasp, sort, divide, arrange and place the physical input devices (blocks), while manipulating the digital content and collaboratively forging new ideas. The story creation combines moving images, sounds and music with verbal language. The manipulation of the blocks stimulates children to explore different possibilities, encouraging them “to try out multiple alternatives, shift directions in the middle of the process, to take things apart and create new versions” [14].

#### DESIGNING A TOOL THAT ADDRESSES THE DEVELOPMENT OF THE NEW 21ST CENTURY SKILLS

In recent years, there has been a strong claim for a change in educational policy and curricula in order to prepare young citizens for the demands of the 21st century society. Creativity, communication and collaboration skills have been identified as fundamental competences for overcoming cultural, geographical and language boundaries in the superdiverse society [15]. Creativity has been considered one of the most important skills to overcome difficult situations and problems. [10:ix] defines imagination as the ability to bring to

mind things that are not present to our senses, differentiating between creativity and imagination. “Creativity is a step beyond imagination: it is putting your imagination to work” [10:ix]. Far from being a special gift, creativity is collaborative, as “creative thinking almost always builds on other people’s ideas” [10:ix]

Mobeybou aims at stimulating children’s imagination and creativity in their storytelling. The collaborative handling of the story elements, which is potentiated and supported through the manipulation of the physical blocks (input devices), provides opportunities for starting a dialogue with peers, teachers and family, and to learn about other countries and their cultures, while practicing oral and narrative competences, as well as negotiation and cooperation skills. Moreover, the digital manipulative provides a collaborative storytelling environment where children are exposed to new concepts, which they can later explore beyond the experience provided by the tool.

#### CULTURE AND CULTURAL REPRESENTATION ON MEDIA FOR CHILDREN

Culture has been defined as including “the thoughts, behaviors, languages, customs of a society as well as the things it produces and the methods used to produce them” [16:2]. Media targeting children, such as television, books, video games or apps are privileged channels to communicate cultural knowledge [16, 17]. Through a careful selection of stories, children can be exposed to a range of ideas, customs, and beliefs which are new to them and different from their own. Stories and storytelling can be



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#### A - India and China

Top: the India group is composed of Meera and Rajesh, Hati - the elephant, Nagi - the dangerous snake, a pungi (instrument) and a pair of jutti shoes (object).

Bottom: the China group is composed of Ju Long and Xiao Li, Gugu - the giant-panda, Nian - the fiery lion, a pipa (instrument) and a fan (object).



## B - Brazil

Exploratory sketches and iterations of Kauê and Iara's characters. The Brazil group is composed of Kauê and Iara, Tatá - the giant anteater, Mumu - the crazy boi-de-mamão, a berimbau (instrument) and a bambolê (object).

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powerful means to teach children to accept difference and view it as a natural way of being in the world [18]. Besides, due to the today's superdiverse society [15], there is a demand for an "increased sensitivity to cultural differences, openness to new and different ideas" [19:7]. Therefore, multiculturalism is of the utmost importance in today's education.

### DESIGNING FOR MULTI AND CROSS-CULTURAL ACCEPTANCE

When designing visual elements that are representative of a given country and its culture, it is important to be aware of and avoid stereotypes, as these representations have the potential to strongly influence viewers [20]; so being mindful of the culture and understanding what is being represented is paramount to ensure proper cultural representations. However, it can be difficult to empathize with the perspectives of individuals from a culture beyond our first-hand experience [21]. Any process of representation of identities, which inevitably simplifies and homogenizes a culture – since cultures are never unitary in themselves – happens through an alienation of the complexities of the culture [22]. We acknowledge it is beyond the scope of this work to create a comprehensive portrait of a given country/culture. Instead, in our development, we focus on creating story elements that have the potential to entice children's imagination and captivate their attention and curiosity, so that they can start a dialogue, and later learn more about the world.

### DESIGN OF THE TOOL

Mobeybou follows an iterative and participatory design methodology, involving children and teachers along its development. It aims at scaffolding young children's ideas to create digital stories by manipulating physical representations of story elements. The digital manipulative intends to move beyond creativity processes based on individual, mental imaginary [23], transforming storytelling into a multimodal (visual and auditory) embodied (through manipulation) collaborative process.

Up until now, we have developed three sets of blocks, representing the cultures of India [A], China [A] and Brazil [B]. Each set is composed of seven elements: two protagonists (a boy and a girl), an animal, a mythical creature, a landscape, a musical instrument and a magical object. All elements are representative of native components of the country or are inspired by the folklore, traditions or mythology of the culture. There are also general elements that represent atmospheric conditions (rain, snow, thunder, wind), which help set the mood for the story and also trigger little comedic moments, meant to be surprising and entertaining for the users [1]. The children can mix and match the various elements from the different cultures to create unique stories of their own. The experience of intertwined cultural elements potentially promotes multiculturalism, as children visualize how rich – both visual and content-wise – the intercultural experience can be. In the following section we provide a detailed description of the tool.

### MOBEYBOU'S FUNCTIONING

Mobeybou promotes the development of a familiar relationship with visual elements of other cultures that might be unknown to the children. It also allows children from different cultures and backgrounds to create and share their own stories, thus creating a visual window to their world, which facilitates communication, develops social competences and increases the awareness of multiculturalism.

Presently, Mobeybou is composed of an electronic board and various sets of physical blocks that act as an interface for manipulating the digital content. The board connects to a computer or tablet via USB or Bluetooth. Each block (4,5x4,5x1cm) has the respective visual representation on the upper face. Placing a block on the board triggers its digital representation on the device's screen. When a block is removed from the board it disappears from the screen. (See the next page for a summary of these interactions and interface components.)

All the elements have specific animations that display different actions. Additionally, there are ambient and background sounds. The visual narratives unfold according to the combination of blocks that the users place on the board while they verbalize their stories. A recording button allows recording/playing children's creations.

Except for the landscapes [J], (which set the stage for the narrative) and the atmospheric-blocks [I] (rain, snow, wind, rainbow, thunder, night), all the elements behave according to a set of rules and constraints that define their actions and the relations to the other active elements (elements on the board). In their story creation with Mobeybou, the children

are incentivized to find creative solutions for the situations that unfold by attending to these rules and constraints, which they therefore need to infer and understand. The underlying constraints are given by the following rules: the antagonists attack the protagonists and the animals [C]; the animals can fight the antagonists back; the musical instruments and the magical objects have magical properties that help to resolve conflicts and can only be used by the protagonists; when an active element is defeated, the physical block needs to be lifted and placed again on the board, in order to bring it back to life. (See the next page for a summary of these interactions and interface components.)



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### C - Interactions between characters

Animals and antagonists have special attacks: Nian spits fire, Nagi strikes and bites, Mumu charges like a bull, Hati shoots flowers from his trunk, Gugu rolls up in a ball and hits, Tatá sticks out his tongue to attack.

Character Interaction

Idle state

Among characters of the same category



or of friendly categories (animals and protagonists)



Protagonist with Instrument or Object

The object's effect neutralizes any conflict on screen, independently of which or how many characters are present



The protagonist makes everyone dance by playing an instrument, therefore neutralizing any conflict



Protagonist vs Antagonist

Number of Protagonists < Number of Antagonists + 2  
Antagonists attack and win



Numbe of Protagonists ≥ Number of Antagonists + 2  
Protagonists scare the antagonists



Animal vs Antagonist

Number of Animals = Number of Antagonists  
Randomly, one of them attacks and wins



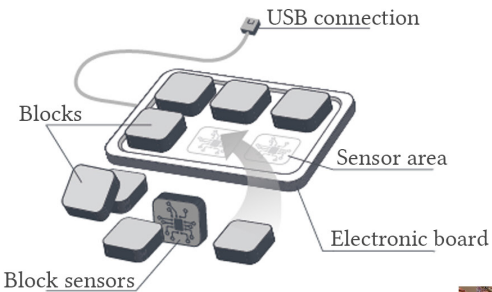
Number of Animals > Number of Antagonists  
Animals attack and win



Number of Animals < Number of Antagonists  
Antagonists attack and win



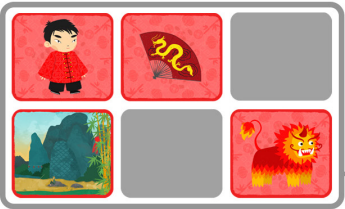
Interface Components



Block Illustrations



This photo, taken by teacher Michael Skøtt Jensen, during a user test session in his class, in a primary school in Denmark (March, 2019) shows the USB-connected electronic board, the Mobeybou blocks and the image they triggered on the computer.



The combination of blocks on the left will cause the interaction depicted below to appear on the screen - with the Chinese landscape as background, Ju Long uses the shān zi to scare off Nian.



### THE VISUAL DEVELOPMENT PROCESS

One of Mobeybou's major goals is to stimulate children's imagination and creativity in their storytelling. Always being careful about cultural representation, we thoughtfully created interesting visual elements, which were animated to interact with each other according to predefined rules. These visual elements open the door to intriguing worlds, potentially immersing the users in the story world. To achieve a high level of immersion, the visual narrative elements should feel familiar (so that children can easily empathize with them), yet intriguing and reminiscent of a fantasy world. Additionally, the content should be tailored to young children, as they are our target audience.

The development of each group started with an extensive research about the country and its culture. Prior to the development of each cultural element, the illustrator carried out a comprehensive investigation assessing various materials and sources. She gathered cultural background information as well as visual information, which served as a basis for the design of each element (See the next page for an example of a Moodboard with photo references). As we moved further along the development of the story elements, we progressively adopted an explorative and iterative design methodology. Outgoing from her research, the illustrator started by creating a series of sketches that she then presented to the design team. Together, they narrowed down the options until a final design was reached. The team mostly discussed small details, like color variance, different hairstyles or pattern choices based on the aesthetic appeal of each image and its degree of representation of the given culture. This iterative design process resulted in a considerable number of sketches (a single element can go through

dozens of iterations before it reaches its final form) but allowed to make conscious decisions based on several options. The process of developing the first group of elements – the Indian visual elements [A] – was relatively fast; the illustrator worked alone and based the designs on visual and cultural information that she gathered through online research [24]. The second cultural group to be developed was China. We are aware that the visuals of China [A, D] may still represent clichés, mainly due to the influence of Chinese representations in pop culture and visual media that we accessed. These stereotypical representations leave an indelible mark on our collective brain, making it difficult to disassociate certain symbols from the culture [24].

The development process of the Brazilian elements [B, G] – the last and third group – took considerably more time than the previous two. The presence of two Brazilian team members informed the design of those elements. Therefore, the visual Brazilian elements have a more complex relationship with the country that they are representing, however, this may create a less obvious connection between the characters and the country/culture that they represent [24]. In order to provide the children with elements that activate their imagination and creativity, we opted for a visual style that is not too realistic but that will be recognized by children that are familiar with mainstream animated content. The users can easily identify the visual language of simple shapes and bright colors of our digital art as being reminiscent and in accordance to mainstream hits like Dora the Explorer [25] and other similar cartoons. Stepping away from realism intends to invite the children to a world of play and of make believe.

However, we avoided over-stylization, as it is important to leave enough detail, so that

the cultural identification is not confined to a single flat symbol intended to represent an entire culture.

To help guide the user through the story elements, there are visual cues that unify

all the elements from a given culture. The repetition of patterns and a consistent color scheme helps the user identify each group (culture) as a whole, without constraining the mixing of elements from the different groups.



D - Gugu design iterations

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E - Moodboard and photo references

## CHARACTER DESIGN

In the following section, we present the rationale behind the visual development of the story elements.

## THE PROTAGONISTS

The protagonists are humans with friendly features, which allows children to easily identify with them. Their design is cartoonish in proportion – their head is almost half their height [B, F] – and there is a prevalence of round features, which are more appealing to audiences and generally make the characters be perceived as being friendly; in opposition to angular shapes, which are usually associated with wicked, evil or mischievous characters. These associations come from nature, where rounded shapes tend to be safe (flowers, fruits) and angular shapes (thorns, fangs) require caution. The instinctive reaction that the audiences have to these visual shapes is based on the sense of touch and, while this sense is not present in visual art, the viewers tend to apply their real-life experiences onto similar shapes [26].

## ANIMALS

The animals are portrayed as friendly creatures that will help the protagonists in case of danger. Their general shape and proportions are very close to that of a real animal, but they are all embellished with elements from the culture to which they belong. Elephants have long been revered in India and so we chose to include them in the story world. Hati [F], the Indian animal, is an elephant whose design was inspired by the decorated animals of the Elephant Festival in Jaipur. For the Chinese animal, we considered several options, such as the golden snub-nosed monkey, the binturong and the tiger; however, our final choice was the panda [D]. This decision was

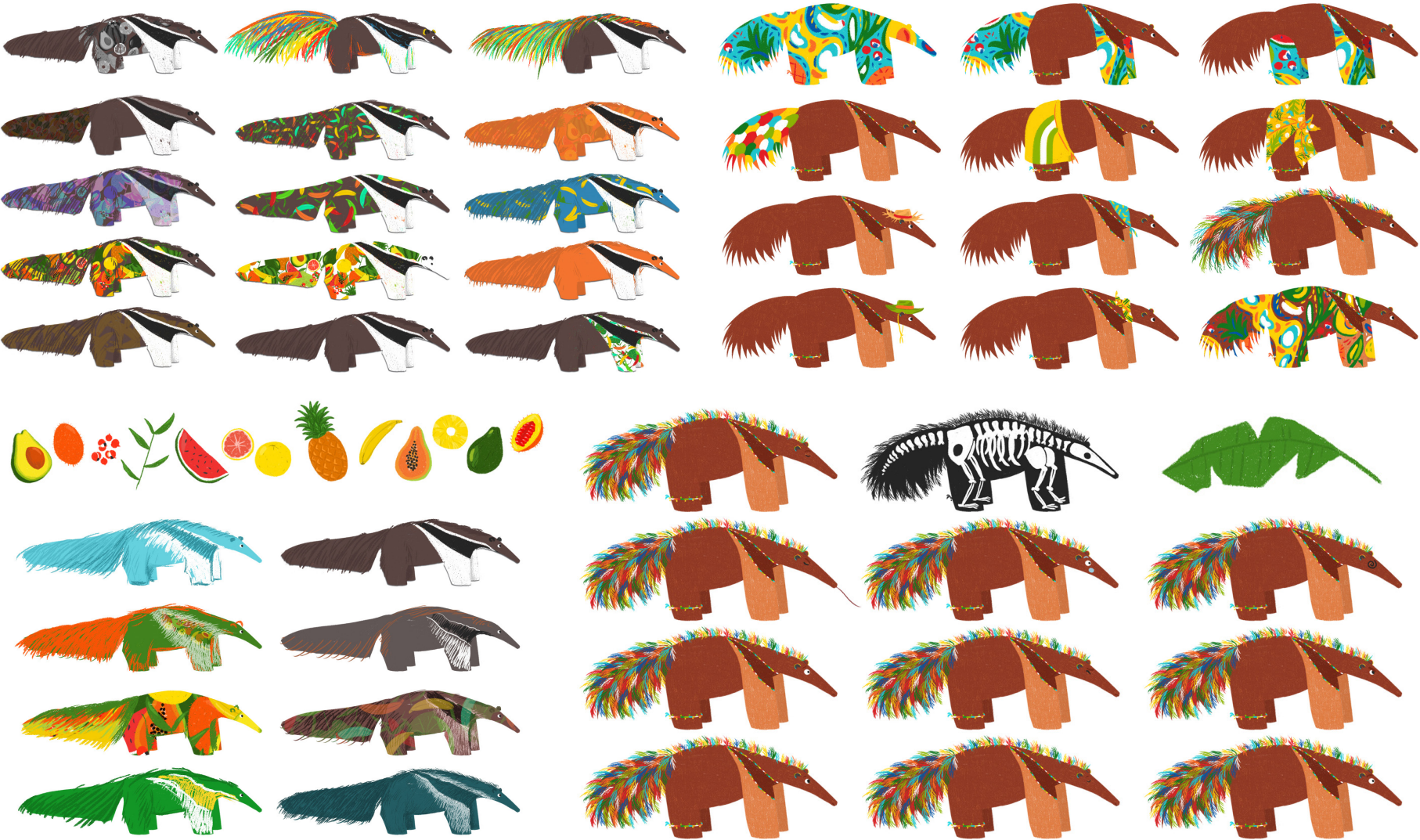
motivated by various reasons: the panda is a native Chinese animal, exclusive to this country (except for the pandas living in captivity in international zoos); it is loved and known world-wide; its conservation status is vulnerable at the moment, and so awareness for its preservation is important for its survival in the wild; it is easily and quickly associated with the Chinese country and culture by audiences everywhere due to mainstream hits like, for example, the Kung Fu Panda trilogy [27, 28, 29]. Finally, pandas' round physiognomy and four-legged stance facilitated the animation process, also allowing to create interesting and funny reactions, e.g. it transforms into a ball when attacking an opponent. Tatá [G], the animal of the Brazilian group – a giant anteater native to Central and South America and one of the species living in the protected area of Pantanal, a wetland region that extends from Brazil to Bolivia and Paraguay – was chosen due to its uncommon look and exoticness.



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F - Character design exploration





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G - Tatá  
Exploratory sketches and iterations of Tatá’s character, the Brazilian giant anteater.

### ANTAGONISTS

The design of the antagonists [H] was inspired by the mythical – and often scary – creatures of each culture's folklore, traditions and myths. Their design has to convey an air of menace, but still be visually appealing to children. The Chinese antagonist is Nian, a fire-spitting red creature, that resembles the flat-faced lion statues guarding Chinese Buddhist temples, as well as the papier-mâché costumes of the traditional lion dance. Nian's development was inspired by a legend that explains the beginning of Chinese New Year traditions. This choice was later validated with a group of researchers from the Confucius Institute at the University of Aalborg (after seeing the character design, they immediately identified it as Nian, the legendary Chinese figure). The Indian antagonist Nagi was based on the legend of nagas, who are semi-divine beings of Indian mythology that can shapeshift between human and serpent form. The Brazilian antagonist is Mumu, the boi-de-mamão – an ox character from oral Brazilian traditions, who dies and is reborn. In our colorful design, there are no legs visible under the cloth that constitutes the body of the



### H- Antagonists

Exploratory sketches and final designs of Mumu. Some of Nian and Nagi's poses and expressions.

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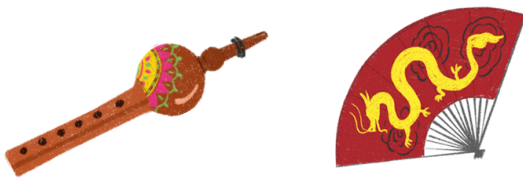
character, so it looks like it floats. However, when it is hit by a lightning strike (when users place the thunder-block), it shows the skeletons of people underneath the costume; referencing the origin of the character as a papier-mâché costume used by dancers in several religious festivals.

### OBJECTS AND MUSICAL INSTRUMENTS

The objects and the musical instruments have magical properties, and can be used by the protagonists to resolve conflicts. These elements are depicted fairly realistically, but when placed on the board, the user sees their magic unfolding on the screen – the Indian shoes (juttis) make the characters float; the Chinese fan (shānzi) creates a tornado; the Brazilian hula-hoop (bambolê) fires confetti [1]. These magical effects can also inspire the children to create a story around them.

### THE LANDSCAPES AND THE ATMOSPHERIC-BLOCKS

The landscapes [J] aim at setting the stage for the narratives, and open the door to a magical world, transporting the children to distant places. Similar to the design of the other elements, in our visual development of the landscapes we avoid representing clichés that depict the most famous monument or landmarks. The landscapes themselves invite to the process of storytelling, hinting at cultural artifacts or native landscapes of the country they represent. This can potentially engage the users in a deeper way, triggering their imagination about stories that can unfold in such environments. The atmospheric-blocks [I] (rain, snow, wind, rainbow, night, thunder) allow to further enrich the setting. However, their use may generate unexpected visual reactions, for instance, after being active for a while, the rain-block will cause a flood, the snow block will freeze the screen after a while and the thunder-block will randomly hit the characters present on the scene.



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### I - Effects

First column: snow; flood; lightning; bambolê firing confetti.

Second column: Mobeybou blocks; frost; children trying out the interface.



## SUMMARY

In this paper, we have presented the visual design process of a digital manipulative that aims at promoting children's collaborative multi and cross-cultural story creation. We reflected upon the question of how to create interesting visual elements, that justly represent a given culture, while fostering the users' imagination and creativity in their storytelling. Along the design process, we became aware that representing a culture is a delicate endeavor, that will almost certainly leave out important aspects of its identity. However, careful consideration, comprehensive research and collaborative creative processes can contribute to developing appealing visuals that may trigger children's imagination and creativity for their storytelling. If a story is also able to promote diversity, acceptance of others and curiosity about the world, it truly becomes a powerful way to understand and share life.

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## J - Landscapes

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Above: exploratory beach landscape for Brazil.

Right: final design for the Brazilian landscape, depicting the Amazonian forest and typical palafitas - the wooden houses on the river; China landscape; India landscape.

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