

Detecting Gender Stereotypes in Children Digital StoryTelling

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ABSTRACT

Gender is a major variable affecting identity and life opportunities from a young age. Our research aims to explore the persistence of gender stereotypes in multimedia stories created by children with the final purpose of attenuating this stereotypical thinking by proposing new processes and tools. The paper investigates the following research question: how can gender stereotypes be detected in the stories produced by children with Digital StoryTelling? We addressed this issue by analyzing 23 multimedia stories created by 83 children, aged 11-12 years. The outcomes were two main contributions. The first, methodological, is an evaluation methodology made of five lenses: Role, Embodiment, Personality, Agency, and Emotion. The second are implications for the design of a tool to stimulate children's discussion around gender-normative attitude and behavior.

CCS CONCEPTS

• Human-centered computing-Empirical studies in HCI • Social and professional topics-Gender • Social and professional topics-Children • Applied computing-Collaborative learning

KEYWORDS

Gender stereotypes, Digital technology and Gender, Technology in Education, Digital StoryTelling, Children Computer Interaction

1 INTRODUCTION

Society has tended to have narrow definitions of what it means to be masculine and what it means to be feminine. Children frequently encounter scenarios where they are expected to engage in gender appropriate behavior, and failure to do so can have negative outcomes for the child [36]. This learned behavior perpetuates stereotypes that

can result in inequalities for both sexes, but particularly for girls and women. Internalizing negative stereotypes impacts on self-esteem and career path [1] and sexism can limit children potential growth and development [44]. Cultural artifacts, such as children's literature and media, can often reproduce gender stereotypes and communicate narrow understandings of gender-normative behavior. For instance, children's books [23] and other forms of media play have a relevant role in communicating "our cultural normativity in a myriad of formats and settings" [56]. Despite a substantial amount of studies that have addressed the issue of gender stereotyping in child development and education (e.g. [37]), less emphasis has been paid to the design of new processes and tools to attenuate stereotypical thinking in the digital artefacts created by children.

The HCI community has been debating different facets of this issue, including gender and computing [21], virtual embodiment [2], feminisms and HCI [5], female representation in computing [7], women in STEM [6], co-construction of gender and technical identities [51], and computing as a "masculinized activity" [47]. Specifically, within this broad area our research is not focused on investigating how to better design technology in order to avoid masculine biases [17] or to investigate the tension between gender identity and the use of technology [51]. Rather, *we aim to explore the persistence of gender-normative behavior and stereotypes in multimedia products created by children with the final purpose of attenuating the stereotypical thinking by focusing on new processes and tools.* Within this remit, the paper aims to answer one important research question: *how can gender stereotypes be detected in stories produced by children with Digital StoryTelling tools?*

We addressed this question by analyzing 23 multimedia stories created by 83 children aged 11-12. The purpose of this analysis was to examine whether gender stereotypes were present in the children's stories, and how these gendered norms were represented. The inquiry showed evidence of gender stereotypes and provided a metric to quantify its impact. Our contribution to the field of Child-Computer Interaction is to identify an evaluation

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methodology to detect gender stereotypes in digital storytelling created by children. The structure of the paper is as follows. Section 2 is about the literature review. Section 3 presents the empirical investigation. Section 4 illustrates the results. Section 5 concerns discussion and future works.

2 LITERATURE REVIEW

In what follows, we present a concise overview of the scholarly work that supports our research. It is important to mention that in the reported literature we have mostly encountered an interpretation of gender as a binary variable and, for pragmatic reasons, we took this approach in our study too. However, we are mindful that not all people identify as “female” or “male” and in future research we will expand beyond this binary distinction.

Gender Development And Stereotypes

Cognitive social learning [12] and gender-schema [33] theories argue that children actively make sense of their reality by organizing their knowledge on gender-related cues and schema which influence their attitudes and behaviors. Cognitive social learning [12] perspective highlights the role of the environment in building gender-normative model and on the active role of the child in the development [31]. While, in the case of schema theory [33] children understanding is polarized on what boys and girls can do. The process of gender development starts quite early and children by the age of 4 or 5 begin having a clear sense of gender boundaries [40] and developing stereotypes [37] to understand themselves and the others. These stereotypes help them to behave and organize their memories [37] as well as to improve their sense of identification with a group [22]. Gender stereotypes and gender-related norms are built through social and cultural interaction. In that regard, gender is a cultural production that relies on people “doing” gender [34]. In addition, stereotypes can be descriptive or prescriptive. The first “reflect a set of beliefs regarding the characteristics that men and women possess” [11], the second concerns “a set of characteristics describing how men and women ought to be” [11]. Thus, gender is a reference to the social, cultural, and psychological attributes the society has associated with masculinity and femininity. And because of the narrow definitions of what it means to be masculine and feminine, children frequently encounter scenarios where they are expected to engage in gender appropriate behavior and failure in following these scenarios can have negative impact on the child [36]. As result children learn behaviors that perpetuate stereotypes that can result in inequalities for both sexes. However, gender attitude and behavior, as

well as stereotypes, change with ages [57]. These changes depend on cognitive development, cultural context, and on children social interactions that influence children’s perception of their and the others’ identity. Between 5 and 7 years old they touch the highest peak of rigidity, in which children consolidate their belief and behaviors [57]. This phase is followed by another one which is characterized by gender flexibility with an open-minded attitude about gender roles [57]. Recent studies showed how intervention during the gender flexibility phase (5-7 years old) can potentially impact on improving “gender relationships for children now as well as the adults they will later become” [56]. While, early adolescence is associated with a gender intensification, the increment of “sex typing of others and of the self” [24]. Within this age long-term gender bias influence more young people [13]. Thus, this period is a critical window during which it is important to stimulate young people to reflect on gender-related issues.

Gender In Literature And Media For Children

Gender, and the norms of human behavior connected to it, are a cultural construction built on top of social interactions and gender representations in cultural artefacts. Indeed, it is “the cultural representations of gender and embodiment of gender in symbolic language and artistic productions that reproduce and legitimate gender statuses” [3]. The presence of gender stereotypes both in adults [53] and children [35] [15] books has been extensively discussed in the literature [55]. Books are often the primary source for the presentation of societal values to the young child e.g. picture books are often populated by gender stereotypes that become often the basis of gender roles [26]. Female characters are generally described as being socially skilled and an emphasis is placed on their physical appearance [15], while male characters are portrayed as active, smart and brave in solving any kind of problem [15]. Already in 19th century novels, gender had an impact on characters’ behavior [30]. Males were categorized as “the doers, this doing was also limited to appropriate actions; emotional, domestic, and passive actions would have been considered feminizing” [30]. The representation of gender through stereotypes have a strong influence on how children perceive themselves and their aspirations for future career paths [16]. Indeed, internalizing negative stereotypes impacts on self-esteem and career path [1]; stereotypes and sexism can limit children potential growth and development [44].

Narrative: A Way To Make Sense Of The Reality

Storytelling is a primary function of human psychology and a fundamental aspect in the construction of meaning [10]. In these perspectives, narrative is a way of mediating a child's organization of knowledge. According to the Narrative Activity Model (NAM) [20] the creation of stories is based on four stages which include *exploration* such as direct or mediated (by social relations or digital tools) interaction with the environment (e.g. a field trip, a book, or a movie). Exploration is followed by a moment of reflection and elaboration of the stimuli (*inspiration*) in which children can understand the different aspects of their experience and dissociate from it. In this phase, they can analyze and reflect upon what they have experienced by producing new content. The *production* phase corresponds to the association process; children externalize the product of their imagination and express their emotions by creating the plot and the characters. At this point, the story can take different forms, e.g. written text, drawings, and/or speech. Finally, the act of *sharing* can happen in different ways, for example verbally by reading or acting and can be enhanced with other elements such as music. This process of exploration and internalization of external stimuli and their elaboration as story elements becomes particularly relevant when we talk about children. Reflecting on past experiences help pupils to elaborate the present and the understanding of their identity including gender. Besides this prominent cognitive function, storytelling has an important social and emotional role too. It helps children construct their identity and express otherwise too complex to describe feelings [14]. Indeed, children's understanding of the many intricacies of the world around them happens also through the creation of stories, individually or in groups, and this may affect their perception of gender stereotypes. Consequently, the use of narrative to investigate gender identity has been extensively explored in social science with adults [8] as well as with children [43]. In addition, gender play a role in the type of narrative children build [46]: girls achieve a better coherence in their narrative and "likely to focus on the links between characters in harmonious social relationships" [25] while boys tend to create "independent characters involved in conflict or aggression" [25].

Digital StoryTelling

The use of technology for storytelling amplifies the power of narratives in terms of supporting children in making sense of their reality by using multimedia elements [52]. Digital StoryTelling (DST) is "the art of telling stories with a mixture of digital media, including text, pictures, recorded

audio narration, music and video" [61]. In the last decade, DST has been used in education in order to improve language learning [52], social skills [50], to stimulate creativity and imagination [49], and to teach STEM subjects [42]. In particular, DST has been proved as an effective pedagogy to illustrate conceptual material, as gender theory [18], by allowing the representation of concepts using multiple modalities (e.g. vision and audition) [41]. Thus, the multimedia dimension of DST showed to have the potentiality for supporting children to build [19], explore, reflect and communicate their identities through the creation of story's characters and structure (e.g. SAGE [59]). The strong power of DST in facilitating self-exploration pushed researchers to apply it as an empowerment research method, for instance to ask young women victims of violence as a way for expression [38]. Moreover, DST has been shown to help students to develop knowledge-based skills and to enhance "a certain awareness of the issue chosen for their story (e.g. violence, racism, war) since the final product transmits a critical perspective on the topic itself" [27]. Considering these benefits, several tools have been developed in different directions. StoryKit [9] allowed group of children to create a story made of photos, audio, text and drawings via a mobile phone. ToonTastic facilitated the collaborative creation of a story by using a multiple-pen display [53]. StoryMat [54] was based on a play mat that recorded the children's voices, noises, and oral stories. POGO [20] offered an enhanced physical environment where children could use different artefacts to create the media contents for their story. Finally, Fiabot! [52], the DST used in this paper, focused on the school context and supported the creation of multimedia stories by actively promoting the interaction between children and teachers to facilitate the process of creating the plot, defining the characters and choosing the narrative media. From the extensive use of Fiabot! with different groups of children [48] we distilled seven design challenges. Each of them relates to a specific issue encountered during design and evaluation of the storytelling experience. Under section 5, we will argue how these challenges can support the definition of design space for raising gender awareness.

3 METHODOLOGY

Literature illustrates that children from early age develop a gender identity [40] by creating gender-related cues that help them to make sense of their reality, organizing their knowledge, and interacting with the environment [31]. Thus, stereotypes have an important role in building gender-normative models and allowing children to interact

with the environment [37]. Stereotypes change along with the children development, and are influenced by cultural artifacts and social interaction [57] that often reproduce negative gender stereotypes and communicate narrow understandings of gender-normative behavior (e.g. books [55]). These cultural products have an important role in children's self-esteem [1] and their future development, including career path [16]. In order to counteract the creation of negative gender stereotypes it is recommended to conduct activities in school to develop critical thinking [39] and to increase the awareness of gender bias [29]. DST is a powerful tool for supporting children building [19], exploring, reflecting and communicating their identities [38]. NAM [20] explains how the process of creation of stories allows the child to elaborate and internalize stimuli and experiences, and transform these in multiple forms and modalities. This is valid for a variety of concepts including gender cues.

The Five Lenses

In order to answer our research question - How can gender stereotypes be detected in the stories produced by children with DST? - we built, assessed and used a methodology to detect gender stereotypes in DST created by children. This is made of different metrics and uses five lenses: *Role*, *Embodiment*, *Personality*, *Agency*, and *Emotion*. Considering that DST is a way for children to mediate world's construction of meaning [10], including gender identity [43], this process and the related outcome represent the child's gender-related belief [59]. Thus, each lens contributes to unveil specific aspects. This approach is based on the triangulation of qualitative analysis of media, narrative analysis of stories [26] and psychometric analysis of text [32]. *Roles* are identified according to the fairy tale functions as proposed by Prop [48]: Protagonist, Antagonist, Antagonist Helper, Protagonist Helper, and Magic Object. For each character the gender assigned by children was identified. Indeed, characters (human and not-human) are the keys elements of fairy tales [28] and these can embody gender-normative behavior in the way these are described (textual, pictorial and audible) as well as in the role they have in the story. Thus, in order to detect gender stereotypes, these elements as well as the multiple forms of their representation are analyzed through the *Embodiment* lens: the physical aspect of the characters represented both in pictorial and textual ways. Regarding the images and videos, two coders make a list of masculine (e.g. aggressive posture) and/or feminine (e.g. cuteness) attributes for each visual representation. While descriptive attributes are extracted directly from text. Each adjective

(from both visual and textual representations) is scored - from 1 (low) to 4 (high) - to assign a grading of the masculinity and femininity attributes. Moreover, stories created by children are affected by the gender of their young authors [46] in terms of how characters interact in the narrative. *Personality* lens is about the descriptions of attitude and morality [45]: data are collected on the basis of the adjectives used to describe characters' actions and belief. These are analyzed by two coders with an inter-coder agreement on discrepancies. Quite often in children's books described female characters as being socially skilled [15], while male characters are portrayed as active [15] and as "the doers" [30]. Thus, understanding the level of characters' *Agency* in the stories it is quite relevant to detect the influence of gender-normative stereotypes on characters. As *Agency* we mean "the human capability to influence one's functioning and the course of events by one's actions" [4]. This is assessed by two researchers who independently coded each story in terms of the level of each character agency - from 1 (low) to 3 (high) - by looking at his/her engagement in the actions of the fairy tale. The coders based their score on the question: how much does the character give direction to the narrative? For instance, the protagonist who won a fight and moved the story to the next level got a high score (3). On the contrary, the character who had a passive behavior got a low one (1). Last but not least the *Emotion* lens. This concerns about the sentiments emerged within the overall story and this is calculated using a standardized psychometric analysis of the text performed by the LIWC (Linguistic Inquiry and Word Count) software [32]. This analysis assumes that the words that people use when they write convey meaningful information about the authors' identity, alongside their perception of the audience and the context within which the communication occurs. The LIWC suited the nature of our stories: their brevity, which was just a few pages, and their simplicity, both in terms of vocabulary and writing style. LIWC searches for stems (i.e., the root of a word to which inflections or formative elements are added) within a text file and clusters them in a set of categories. They are based over decades of linguistic and psychological research with the aim of understanding the psychological characteristics of people by looking at their linguistic behavior. The categories include words denoting social, affective, cognitive, perceptual, and biological processes. The text of the stories was analyzed based on the Italian dictionary. The software processed each piece of text independently and counted the number of times a stem occurred. This number is expressed as a percentage of the total word count in the story. In this paper we focused on

the affective category, following the stereotypes, which describe girls as more emotional than boys, and justify emotionality better as a female behavioral outcome. The values extracted from each story and for each emotional category were aggregated and averaged according to the group that authored it: all females, all males or mixed-gender.

These five lenses are the main pillars of the methodology for detecting gender stereotypes elements in multimedia stories. Following we present a case study in which the methodology was applied.

Data Collection and Participants

We analyzed 23 multimedia stories produced by early adolescents (11-12 years old). We addressed early adolescents because this age group is associated with a gender intensification [24] (after a period of flexibility) [57]. The stories analyzed in this paper were collected as part of a larger study conducted in 2017 following 4 day-long storytelling seminars run by the teachers of two first-year classes of a Secondary School in Switzerland. In this educational system, pupils exercise storytelling as part of their curriculum. In addition, pupils had knowledge of how to create stories from previous experience in primary school. The story creation followed the workflow and approach described in [52] using the iPad. The multimedia stories kept the fairy tale structure and were narrated using audio, text, images, video and photos. Children were grouped in teams (up to 4 each) by the teachers, with the aim to balance their language, digital literacy, and drawing skills (as in [52]). Teachers also considered children’s ability to collaborate within a group. A total of 83 children (M=45, F= 38), along with three teachers acting as facilitators, participated in the study: 5 all-girl groups, 9 all-boy groups, and 10 mixed groups (for each mixed group M=2, F=2).

4 RESULTS OF THE ANALYSIS

Roles

Children spontaneously associated a gender to each character, with a preference for male characters who accounted for some 65% of the entire sample. The bias did not affect the protagonists who showed a fairly equal distribution of males and females (Table 1). The majority of other characters (antagonists and helpers) were males. If we consider the gender composition of the author groups, as in Table 2, it is interesting to notice that for the protagonist helpers, both female and male groups, chose a predominance of male characters. In the mixed gender

groups, the gender of protagonist helpers was fairly split across male and female.

Table 1 Frequency of role by character gender

Role	Male	Female
Protagonist	27	25
Antagonist	20	7
Antagonist helper	8	2
Protagonist helper	33	13
Total	88	47

Table 2 Protagonist Helper gender as a function of groups

Protagonist Helper	Male	Female
Female groups	7	1
Male groups	13	1
Mixed groups	13	11

Embodiment

Only two stories did not provide any physical description of the characters and just one had no images at all. Across remaining 21 stories representing characters, male protagonists (68%) appeared more often than female ones (32%).

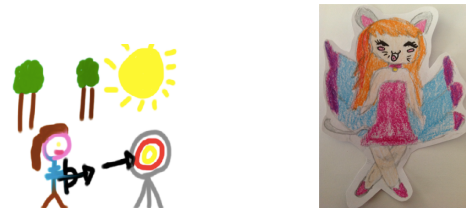


Figure 1 Drawing created by a boy (left) and by a girl (right)

This is in contrast with the stereotypical attribution that physical appearance is more important to females than to males. The visual representations created by the male groups had a strong masculine flavor, even when the character was female. For instance, in S5 the princess Yara was described as practicing her archery and being dressed in male hunter clothes (Fig. 1). On the contrary, the portraits of female characters produced by the female groups had strong feminine elements. In S4 the protagonist was depicted with a pink dress, blonde long hair, big eyes, and high heels (Fig. 1). Children often portrayed the male protagonists with stereotypical elements denoting power (i.e. weapons, crown or sharp teeth). In the mixed-gender groups, the representation of characters was more fairly distributed across female and male characters, however both were represented with evident stereotypical elements. Female protagonists were often beautiful with blonde hair, clear eyes (blue or green), with colorful and elegant dresses

e.g., “*she was as beautiful as the sun, had blue eyes like the deepest of the seas and blonde hair like honey*” in S12. Male protagonists fitted well into the stereotype of masculinity; they were attractive, strong, tall, well dressed, and often armed, e.g. “*a tall, muscular young man with blue eyes and reddish hair. He usually wore a heavy gold armor and an indestructible helmet*” in S17.

Personality

Personality traits were extrapolated from the text analysis, by considering attributes used to describe each character. The most interesting descriptions addressed the antagonists. Male antagonists were described using a restricted list of recurrent adjectives: i.e. mean and evil. Meanwhile, females were defined using a richer, both in terms of quantity and variety across stories, set of negative qualities i.e. envious, cruel, very vain, horrible witch, jealous, and persuasive. No difference was identified in the way groups of different gender described the personality of their characters.

Agency

We explored agency in terms of behavior and role for each character in the stories and analyzed the types of agency associated with male and female characters. The mean agency of male protagonists was significantly higher than that of females (Table 3). Female protagonists had a less active role in the stories and males tended to be the “doers”. Interestingly though, female antagonists scored a higher agency than their male. When considering group composition, we could observe that for female groups the agency of the male protagonists was similar to that of their female equivalents (delta = 0.5). Conversely, in both the male and the mixed gender groups the delta was almost three times larger (Table 4).

Table 3 Protagonists and antagonist mean agency across groups

Agency	Male	Female
Protagonist	2.7	1.9
Antagonist	2.4	3.0

Table 4 Protagonist agency by groups

Agency	M protagonist	F protagonist	Delta
F-groups	2.7	2.2	0.5
M-groups	3.0	1.5	1.5
Mix-groups	2.8	1.6	1.2

Emotion

The LIWC analysis showed that the stories written by the female groups contained a higher percentage of emotional

words (6%) as compared with the stories written by male and mixed groups (both 4%). An exception was noted for the “*rage*” category, which was higher in the stories written by male groups (0.8%) when compared with the stories produced by female and mixed groups (both 0.4%).

Analysis of Findings

Stories revealed the same stereotypes as in children’s books written by adults [15]. In fact, the role of the characters, their agency, the emotions expressed, and their embodiment were deeply grounded in the same gender stereotypes as those used by the authors of 19th century novels [30]. However, it was interesting to notice how our methodology allowed us to investigate how different elements of the DST process, such as collaboration across group members, the composition of visual representations of characters, and the creation of multimedia, can affect the presence of stereotypes. Through the *Role and Emotion lenses*, we could see how the persistence of these stereotypes was at times moderated by mixed-gender groups, who were more likely to envision a female protagonist helper, and at the same time to attenuate female emotionality and male aggression. This is known also in literature [25]. However, the *Agency lens* shows a different trend. Male characters have strong agency in stories created by male and mixed groups. When created by female groups, the difference between female and male protagonists is less accentuated. A noteworthy exception is that of the female antagonist (the witch in traditional storytelling) who was as active as the male characters. Overall, a balanced presence of gender participants in the group does not mitigate the tendencies to represent female and male with gender-stereotyped behavior. Similarly, through the *Personality lens*, we see how the textual representation of characters, both in terms of attitude and morality, is strongly stereotyped, and the gender composition of the groups has no influence on this. The *Embodiment lens* shows stereotyped representations produced by mixed and female groups. The exceptions are drawings made by male groups, where we find an evident masculine flavor even when depicting female subjects. The persistence of gender stereotyping in fairytales narrated by early adolescents may be not surprising as these tales are expected to portray stereotypical representations. Yet, we believe that designing a DST tool could act positively in the direction of counteracting stereotypical thinking by design.

5 DISCUSSION AND IMPLICATIONS

Literature shows that gender representation in a cultural product [3] can have an impact on children self-esteem [1]

and their future career path [16]. Challenging this issue is the main motivation that drives this research. In the paper we presented our first step devoted to explore whether and how stereotypes are represented in multimedia products built by children. Our effort has resulted in two main contributions. The first is an *evaluation methodology* that aims to analyze and assess the persistence of gender-normative behavior and stereotypes in multimedia products created by children. The second concerns *implications for a design space* to guide the production of a new DST system to stimulate the discussion around gender stereotypes and mitigate gender-specific behaviors and attitudes.

Evaluation Methodology

The evaluation methodology was conceived specifically to support us in finding an answer to our research question about how to detect gender stereotypes in multimedia stories. It proved effective in driving the analysis of characters across the stories. Following we highlight its most relevant aspects. **Addressing the different digital media.** Considering the different types of media used in the stories we needed different metrics and techniques for their analysis. This helped to get a better understanding of how the specific features of each media, e.g. colors in the drawings, contribute to the detection of gender related elements. **From micro to macro.** The metrics used for each lens revealed specific insights that contribute to sketch the overall picture. The use of different techniques and tools (e.g. from thematic analysis to natural language processing) allowed us to acquire a specific understating from the perspective of each lens as well as it contributes to improve the comprehension of the full picture. **Flexibility of the lenses.** Tools and techniques used in each lens can be changed independently from the others. For instance, if LIWC would be substituted by another method, it won't affect the other lenses, or the tools used by these. As well as there is not an order in which the lenses are applied; it is possible to start from whatever lens deemed as most suitable. **Adaptable to other product.** This framework can be used in other contexts to analyze children's multimedia artefacts when looking for the presence of different stereotypes in addition to gender (e.g. race, education etc.).

Implications for a Design Space

DST has the potential for stimulating the discussion around gender stereotypes. In particular, by building activities that bring children to discuss, share and confront their thoughts, beliefs and knowledge regarding gender and gender

stereotypes. In the next step of our project we will define a design space for the production of a digital tool to support these activities. We will start from what we have learnt about how the different elements of the DST process can affect the presence of stereotypes in the stories. This will be combined with the outcomes of our previous experience in the design and evaluation of DST for children [48] distilled into seven design challenges. Here revised to address specifically the presence of gender stereotypes in stories. **Turn-taking.** Across ages and schools, when children have to collaborate often have a problem in turn-taking. When using technology [32], gender plays an even more important role here. Thus, it is important to design a turn taking mechanism that, regardless of gender, allows children to contribute to the story equally. **Collaboration.** Social interaction is relevant for the creation of gender stereotypes [34] as well as to the development of characters and plot [46]. Thus, providing a space/workflow that encourages children to share their personal experience and belief is an effective way to stimulate a discussion around these topics and increase the awareness of gender bias [29]. **Scaffolding with questions.** The process of exploration and inspiration [20] allows children to build original plots and characters. Within this process the new system should encourage young users to reflect on aspects of characters and plot related to gender. **Story recapitulation.** Making children go over the story and summarize it helps them get a better understanding of the plot and characters' behaviors, while detecting elements of gender stereotypes. **Compliments and Encouragement.** Positive reinforcements are particularly relevant considering that girls more than boys can suffer of low self-esteem [58]. These can refer to their ability in developing the story as well as in creating media. **Story coherence.** Having an overview of the coherence of story's elements can help children have a better understanding of connections between events and also "to the ways that they represent and coordinate characters and their relationships"[46] including gender related attitude and behavior. **Mix Media toolset.** Images, audio and text embody and express gender-related attributes [60]. We should provide a set of tools to encourage children explore beyond traditional gender representations and use multiple modalities (e.g. vision and audition) [41] to discover, reflect and communicate their identities[19].

In the next step of the project we will further investigate these revised challenges with relevant stakeholders (teachers, experts in gender, and children) with the purpose of defining dimensions for the design space to guide the production of a new DST to raise gender awareness.

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7 SELECTION AND PARTICIPATION OF CHILDREN

Prior to the study, faculty ethical approval was obtained, children participated on a voluntary basis and they could leave the study anytime. The school informed parents and obtained their consent. Children were told about the aims of the research. Teachers acted as facilitators and made sure that children did not feel under any pressure.

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