Fostering Cooperative Activism through Critical Design

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ABSTRACT

Critical design is gaining momentum in interaction design, yet little CSCW research has focused on articulating the cooperative potentials of critical design artefacts. We address this gap by reflecting upon a design project aimed at overturning the prevailing narrative regarding dyslexia in Italy. The adversarial propositions embedded in our critical design artefacts challenged the description of *dyslexia as a learning disorder* putting forward the view of a *learning difference*. These artefacts demonstrated their capacity to bridge heterogeneous social worlds (those of teachers, children, and parents) into one cooperative entity and mobilise cooperative activism. The contribution to CSCW is two-fold. Firstly, we introduce the cooperative potentials of critical design artefacts; secondly, we propose critical design as a strategy for researchers engaging with cooperative activism.

Author Keywords
Critical design; boundary objects; common field of work; dependencies; cooperative activism; dyslexia.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous,

Introduction
The politics of cooperation has long been a core interest in CSCW research (e.g. [6, 33]), yet it remains a challenge to identify specific design activities that can foster cooperative activism. We refer to cooperative activism as the actions and practices which bring together heterogeneous groups of people who are dedicated to a political agenda through interventionist undertaking. What makes cooperative activism interesting for CSCW is understanding how the nature of the interventionist actions that traverse different social worlds becomes constitutive of a common field of work, and the role of design artefacts in facilitating cooperation. Critical design can provide a distinctive solution to this challenge. It embeds political statements into artefacts which prompt reflection through ambiguity and provocation [14, 3].

This paper opens a conversation between critical design and CSCW by (*a*) analysing the cooperative potentials of critical artefacts and (*b*) proposing critical design as a strategy to foster cooperative activism. The importance of this dialogue was highlighted long ago by Susanne Bødker while reflecting on the nature of the third wave of HCI [7]. Yet, there are still a number of open issues on how the design of artistic and non-instrumental artefacts may benefit from the theories and methods of CSCW research and vice versa. The paper brings CSCW and critical design closer by presenting a reflection on critical design artefacts as a vehicle for activism in the "Dyslexia Debate" [13] in Italy. Dyslexia is a neurocognitive characteristic associated with literacy difficulties that cannot be explained by low intelligence, socio-economic disadvantage, poor schooling, sensory (auditory or visual) difficulty, emotional and behavioural difficulties, or severe neurological impairment that goes significantly beyond literacy [14].

The controversies surrounding dyslexia are associated to the operational definition by exclusion (all but one diagnostic criteria should be absent) and exacerbated by the criteria that open important cognitive, social and political discussion. For example, there are foundational concerns about the operationalization and utility of intelligence measures in pedagogical interventions. Furthermore, there are strong correlations between school qualities, socio-economic variables, and emotional or behavioural difficulties. The dyslexia debate is politically contested because a certification discriminates between students who are entitled to special education provision and those who are not. Consequently, it exposes important implications related to educational policies, funding distribution and equal opportunities [26]. The debate builds on two antagonist narratives. The consolidated one describes dyslexia as a learning *disorder* (or even a disability) to be treated with individual clinical intervention; the emerging

one describes dyslexia as a learning *difference* to be addressed by inclusive education.

Our critical design project aimed at reinforcing a positive view of dyslexia in Italy. The project took the form of a collaborative effort between schools, parents, government, artists, designers, and researchers. It followed an interventionist approach, where the researchers took an active stance advocating in favour of an agenda through the making of critical artefacts. These artefacts were crucial for the kind of engagement the researchers had with the field, setting the ground for the emergence of cooperative activism. Their physical manifestation acted as boundary objects among different social worlds and created relations across loosely coupled individuals. The paper first introduces the related work on critical design and artefacts and our conceptualisation of cooperative activism. It then presents the method and data sources of the case study, describing two critical design artefacts (the "alternative lenses" and the "Lego bricks") and discussing how these artefacts were able to foster cooperative activism. Finally, it concludes by suggesting future work on critical design for cooperative activism.

RELATED WORK

Critical design is an approach to design where propositions that subvert an established status quo are embedded into artefacts [30]. Accordingly, critical design practices target artefacts that stimulate reflection on political and societal issues through provocation and ambiguity. Due to its emphasis on design and implementation, critical design is often referred to as an interventionist, or design through research approach [3]. In addition, its special focus on creating artefacts beyond consumer products places critical design at the edge of art and design [3]. Artefacts emerging from critical design activities can be digital, physical, or a combination of these. Some artefacts do not involve technology, whereas others are entirely dependent on complex computational systems [11]. The choice is usually grounded on the designer's skills and interests [17].

An important aspect of critical design is the hegemony of the artefact. Elaborating on this aspect, some researchers suggest that critical designers should be encouraged to build on their "design authorship" [24]. This means that artefacts of critical design should embody "intentions or ideas arising from a concern or curiosity of the designer" [24] and people should be invited to reflect, or act, on these concerns through the enactment of the artefacts. This view is in sharp contrast with mainstream CSCW design methods that build on approaches such as Participatory Design or User Centred Design.

Different aspects of critical design are present in several design perspectives on ideation, implementation, or enactment of artefacts. For example, speculative design focuses on ideating artefacts that challenge existing conditions by imagining alternative futures [30]. In this view, the actual development of the artefacts is not paramount. In contrast, critical making stresses the importance of developing artefacts by tinkering, making, and hacking activities [25]. Approaching from a different angle, public design investigates the importance of artefacts in articulating matters of concerns that could lead to public formation [12, 19, 10]. It is clear that many of these perspectives share important research questions with the CSCW agenda, where politics and activism have long been core interests [8, 35, 2, 6, 33]. Still, little attention has been paid to the cooperative potentials of critical design.

Cooperative activism covers the dedicated interest in changing a field of concern by bringing together groups of people who take a common stand despite being dispersed and diverse. Practice-based studies in CSCW expose the paramount role of artefacts in coordination and articulation work and highlight the need to understand them in terms of the context in which they are enacted [29]. More importantly, the role played by artefacts in cooperative situations has led to the evolution of concepts that emphasize the collaborative aspects of artefacts. Indeed, artefacts have been pointed out as playing a major role in coordination activities [29] as well as supporting awareness activities at work [13]. In addition, artefacts can facilitate the emergence of a common field of work. The CSCW research community is in general agreement that cooperative work, by definition, refers to situations where multiple people are mutually dependent on each other through a common field of work [27]. We propose that critical design artefacts can produce a common field of work among heterogeneous people connected by similar interests that are experienced through different matters of concern. This field of work can foster cooperative activism.

A central concept in facilitating the creation of a common field of work is that of the boundary object. The term boundary object identifies an artefact that is stable enough to travel across social worlds while being flexible for interpretation [29]. These characteristics render boundary objects particularly useful to support grounding communication [9] across social worlds. Grounding refers to the practice by which people display their knowledge that others can monitor and use to refine their interpretation accordingly, thereby creating a common ground [9]. Common ground is essential for the emergence of cooperative activism. It serves as the foundation upon which cooperative partners have knowledge in common [23]. Creating common ground across diverse social groups (e.g. parents, children, school teachers) is difficult since each subgroup has their own vocabulary, concerns, and practices. Therefore, an essential activity in the design of critical artefacts entails fostering a common ground with boundary objects through which dispersed individuals can share cooperative activism.

CASE-STUDY

The design activities featured in this paper were developed in the context of Città Educante (2014 - 2017), a research

program funded by the Italian Ministry of Education and Research that aims to highlight the role of a technology equipped city as a learning place. As part of our involvement in the program, we initiated SPAZIOd, a project that attempts to address the difficulties that the Italian educational system faces when dealing with different ways of learning, with a special focus on dyslexia. The project included several technology design interventions (e.g. a videogame for cognitive training, an automatic tool for assessing reading complexity, and an dyslexia awareness community platform) and led to the organisation of the Dyslexia Awareness Week, which took place between October 5th-11th 2015 in Trentino (Italy).

The project was inspired by a critical design philosophy [5] and engaged a contemporary CSCW study [16] characterized by a mixture of ethnography and design activities. The design artefacts produced were not just project results but provided means to explore and study the context. The dyslexia debate and associated controversies in Northern Italy backgrounded the empirical case. The Dyslexia Awareness Week serves as the core situation in the paper, with particular reference to two artefacts exhibited in it: the "alternative lenses" and the "Lego bricks".

Field setting
Focused attention towards dyslexia in Italy is a recent development and mainly due to a law approved in 2010 that guarantees special education for dyslexic students. The law regulates education for students "affected by DSA" (the Italian acronym for Specific Learning Disorders) and builds on a medical narrative. It sets out the "diagnosis" criteria and prescribes interventions, such as training for teachers, didactic instruments for children, and financial support for families. In particular, the law enforces the introduction of alternative teaching methods and the adoption of computer technology to facilitate learning. However, it fails to indicate clear practices, thus decisions on compensatory interventions are often subject to the interpretation of teachers.

The activities of this project were situated in Trentino (an autonomous province in Northern Italy) at the moment when new local educational policies mandated a Content and Language Integrated Learning methodology to be implemented in German and English ("Trentino Trilingual"). This methodology prescribes teaching a foreign language and a subject at the same time (e.g. teaching mathematics in German). The policy was part of a political program in the Euregion formed by Tyrol (Austria) and South Tyrol-Trentino (Italy). Its implementation in Trentino encountered fierce resistance from teachers and parents. A source of controversy regarded the lack of explicit considerations for inclusive education. Several public rallies were organized to resist the new policies and advocated for a more inclusive educational environment in the region.

Data
The data source that served as the empirical foundation of this work was diverse and multifaceted (Table 1). The grounding activities where these data were collected included ethnographic and autobiographical reflection [22] supplemented by interviews with relevant actors (parents, teachers, experts, and government officials), attendance to different meetings (e.g. seminars at schools and meetings organised by a group of parents), and analysis of various online sources including institutional websites and social network groups. We also organised two meetings with those government officials responsible for specific learning disorders and the trilingual policy.

Table 1 - Data sources in the research phase

Data source
Eight semi-structured interviews with related actors such as parents, teachers, government officials, and educators
Three local events around the topic of dyslexia organized by schools and by experts on dyslexia
Two monthly meetings organized by the local group of parents of children with dyslexia
Two meetings with local government officials responsible for the DSA and "Trentino trilingual" policy
National and international websites and social network groups organized around the topic of dyslexia
Four official documents on the "Trentino trilingual" policy
Four public documents containing the minutes of meetings regarding the "Trentino trilingual" policy

The Dyslexia Awareness Week program targeted schools and the general public. Running from Monday to Friday, it involved five schools located in different areas of the region. These schools acted as a hub for all local schools in the area (Table 2). The program included presentations and hands-on activities, conducted by dyslexia experts and involved 321 children and 191 teachers. In addition, three plenary sessions (featuring presentations by a clinical psychologist, a representative of the local government and a representative of the health agency responsible for dyslexia certification) were organized and opened to anyone who wanted to participate. These sessions provided opportunities for encounters among parents, teachers, experts and local government representatives. Technology demonstrations were provided at the school for the participants to interact with.

The public event took place over the weekend in a large room of the modern Science Museum in the capital of the province, and was admission free. It was arranged as a curated exhibition including many artefacts created with the aim to foster positive awareness on dyslexia. Upon entering the exhibition space a visitor would first face the "alternative lenses" artefacts surrounded by posters on

dyslexia presented by experts, a dissemination video realised with the "Lego Bricks" artefact and an interactive quiz testing knowledge on dyslexia projected on a wall and operated via mobile phones. It also included two games, one exploiting spatial thinking [21] and one supporting cognitive training. In one area of the room was staged a concert where visitors could play cardboard music instruments [34]. The rest of the space exhibited commercial technologies and research artefacts for compensating reading difficulties. A parallel event took place in the museum's FabLab where children could tinker with the "alternative lenses", personalising them as animals. Overall, the public event presented an opportunity to reach the general population.

Table 2 - Activities and number of people engaged in the Dyslexia Awareness Week

Activity	Number	People involved
Workshops with children	17	321 children
Workshops with teachers	6	191 teachers
Cognitive training with video-game sessions	12	258 children
Plenary sessions with parents, teachers and local government	3	100 – 150
Demo sessions at schools	5	100 – 200
2-day event at the science museum	1	More than 150 [1]
Wearable Zoo workshop at the FabLab	1	30 children

Data analysis
Over ten different researchers were present in the museum at all times during Dyslexia Awareness Week. They interacted with visitors while taking field notes. We systematically examined all the data-collection materials to identify what artefacts were pertinent to creating a common field of work across the heterogeneous groups, and fostered cooperative activism related to dyslexia. In this paper we present two critical artefacts that were instrumental in creating a common field of work across the social worlds of participants. Unique to these two artefacts was their ability

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[1] Due to the fact that the event was admission free, it is difficult to estimate the number of people involved. However, we can provide a minimum estimation since we received written feedback on the event from 153 people.

to engage with diverse sets of individuals at different times and in different places – while the artefacts remained unchanged, they proved flexible for local interpretation.

The two critical design artefacts were the "alternative lenses" and the "Lego bricks". We performed a within-case analysis focussing on each artefact as a single entity – this study was then followed by a cross-case analysis [1], in which we compared the role and nature of the artefacts to identify common features and characteristics. In particular, we focused on those characteristics related to the artefacts' ability to form connections across different social worlds. Through this analysis, we identified the patterns of relations and links between actors and, in particular, how the artefacts were able to facilitate a common field of work and foster cooperative activism. The next section describes design and enactment of these artefacts

DESIGN
In SPAZIOd, the grounding activities (Table 1) were conducted with the aim of unpacking the complexities of the political controversy on the dyslexia debate in Italy. The results of the grounding activities were then used in the critical design of our artefacts. In addition, they allowed relevant actors to meet and exchange ideas, some for the first time, as in the case of the two government officials responsible for the areas of "specific learning disorder" and the "Trentino trilingual" policy. Participants included children, parents, teachers, associations, experts (e.g. cognitive scientists, psychologists), the local government, and the local health agency – and we dedicated time to identify their political agendas, concerns, and motivations for engaging with dyslexia. This analysis led to the identification of *key concerns* that were relevant across several of the actors, and thus became central to our design [20].

One of the main concerns referred to the *narrative* that describes dyslexia in Italy. It was evident that most the actors were deeply concerned about depicting dyslexia as a disorder, a disability, or even a disease. This perspective of dyslexia as a disadvantaged state is profoundly engrained into the society and was reflected in both language and policies. Paradoxically, the local government, institutions, teachers, parents and students themselves uncritically used the very same acronym (i.e. DSA) that they found problematic. The prevailing medical narrative of dyslexia generated negative *emotional load* on children and parents. Several teachers and parents highlighted that many dyslexic children had low self-esteem and felt inferior to their peers, thus they preferred to hide or mask this characteristic.

One of the related problems was that children often decided not to take advantage of the compensatory instruments they had access to by law, such as using a computer in the classroom, which in Italy is not common practice. As highlighted by some teachers, the decision not to use computers triggered a vicious circle. Without the computer, children experienced difficulties in following the pace in

the class and, thereby they constantly needed to catch up with their classmates, increasing frustration and risked lowering their self-esteem. The critical design project focussed on challenging the narrative of dyslexia *as a disorder* that generates a high *emotional load* while presenting technology as a capable solution for learning.

Alternative Lenses

The "alternative lenses" artefact is a construct that combines several nested metaphors aimed at breaking the vicious the cycle around the use of computers in the classroom, which contributed to the narrative of dyslexia as a disorder and generated negative emotional load.. In addition, the metaphor of viewing through different lenses draws our attention to divergent perspectives that can be used to examine a concept and dissect various influences on the narrative describing it. The lenses were created with a fun, technology-enriched artefact that exploited the ludic dimension of technology to make it more accessible to children. Play with the artefact reflected a typical explanation that teachers and clinicians give to children when convincing them to use technology-based auxiliary tools: "*computers are for the dyslexic what glasses are for the short-sighted.*"

Design

The "alternative lenses" included two tangible objects, namely a poster and a pair of cardboard glasses. The poster displayed a sentence written in "Dyslexia*"*, a type font designed by Dan Britton, a British designer who is himself dyslexic. This font aims to incite aesthetic appreciation in addition to allow people to experience the difficulties that dyslexics commonly face when reading. The cardboard glasses were a DIY virtual reality headset that allowed the exploration of a 3D landscape. The landscape is displayed as a photosphere image on the screen of a mobile phone placed inside the cardboard glasses (Figure 2). The connection between the cardboard glasses and the poster was established by including an image of the poster within the photosphere. However, in this case, the poster contained a sentence written in "Open dyslexic" an open source type font[2] specifically designed to facilitate reading [18]. Wearers of the cardboard headset could experience different photospheres by tilting the cardboard glasses. An example, translated into English, is presented in Figure 1. This figure shows a part of the physical poster, which contained the text " 'Education is the most powerful weapon which you can use to change the world' N. Mandela" and its digital representation inside the photosphere image.

Three posters were created with different quotes on learning from M. Montessori and N. Mandela. In addition, six photospheres were designed for two different sets of cardboard glasses. To enhance the playful experience, the

photospheres displayed images of exotic places, for example the surface of Mars and underwater scenes.
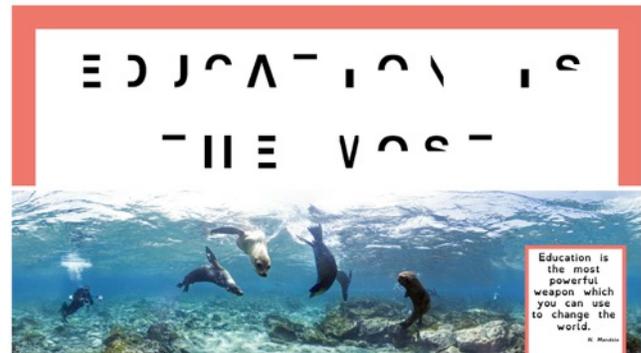

Figure 1. Poster detail (top) and photosphere (bottom)

Intervention

The "alternative lenses" welcomed visitors at the entrance of the exhibition as a playful provocation that challenged the existing narrative of dyslexia and proposed an alternative one, paving the way for the rest of the exhibition. The glasses attracted both adults and children and supported interaction among them. The typical engagement transpired as follows: a child tries out the glasses, she would usually turn around and exclaim "how cool!" or "wow!", this behaviour would attract other people and many children would hand the glasses directly to other children inviting them to participate.

While the children were enjoying the glasses, many parents took the opportunity to talk with the researchers. These dialogues allowed the parents to unburden themselves of their troubles . Many parents highlighted that their children did not want to talk about dyslexia and that many of them experienced anxiety. This situation is exemplified by the case of one child, her older sister and mother entering the room. The child had to be physically pulled into the room since, as her mother explained, "*she does not even want to listen to the word dyslexia*". At first, the child was reluctant, but after seeing her sister playing with and enjoying the glasses, she gave them a try. After this, her enthusiasm was awakened and she decided to visit another part of the exhibition where she played a game, later returning to the glasses.

Some parents mentioned that teachers had spotted that their child might have reading or writing difficulties or that their children were been tested for dyslexia. Most of them seemed worried and often asked questions regarding the process of diagnosis. In these cases, it was crucial that the exhibition of the "alternative lenses" included a group of cognitive scientists providing advice to parents. The "alternative lenses", as a critical design artefact, connected different and diverse actors with a dedicated interest in the political agenda of dyslexia in important ways. Moreover, the "alternative lenses" also facilitated a connection to

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[2] http://opendyslexic.org/

additional actors only peripherally engaged in the dyslexia agenda (e.g. people with no direct relations to the topic). For example, the glasses became a talking point to help explain dyslexia to people who were unaware of the major concerns experienced by parents and children prior to the exhibition. By extending the knowledge about dyslexia, the "alternative lenses" initiated a mobilization of interest. This is important since establishing a critical mass is paramount to facilitating political action.

The enactment of the "alternative lenses" as a critical design artefact also confirmed a general confusion concerning dyslexia. For example, some parents asked whether the poster showed how their children saw written text. These situations were very delicate, since it was critically important to us that the message of the artefact was not misinterpreted. While the openness of the artefact was important to engage people, it was also important to ensure that reliable information was passed. On this perspective, interaction with visitors during the event was crucial. Many parents asked their children to read the physical and digital posters, as a kind of a test – rather than focusing on the playful experience during the exhibition. This was not our goal, and thus in the face-to-face interactions with visitors we tried to reduce the evaluation component and instead focus on challenging the prevailing narrative of dyslexia in Italy.

Figure 2. Cardboard glasses

Next to the posters, on each was the picture of the type font designer with his name, a QR code to his website and a quote stating his motivation for creating the font: "*being a Dyslexic student I wanted to create a piece of artwork that would allow an understanding and a sense of empathy between non Dyslexics and Dyslexics*". We presented him as an "outstanding British designer, who is himself dyslexic". One couple, whose son is dyslexic, paid much attention to the font as a standalone piece of design. The mother introduced herself as the director of the first Montessori school in the region, who had recently discovered that their youngest son was dyslexic. They became very interested in the poster and the font and took a picture of the QR code to contact the designer. They

expressed an interest in creating similar posters to be placed at their local school. This observation suggests that the alternative agenda enacted by the artefact inspired related actors to extend its use in different settings and forms.

The workshop at the FabLab also reached people who did not have a personal or professional interest in dyslexia. While people (mostly parents and children) waited in line to access the workshop, they stood next to the posters and a researcher explained the motivation behind the activity. Many people did not know much about dyslexia or thought that it was a disease, confirming previous results. The critical design artefact helped by recalling situations at school. For example, a mother, talking to her daughter, explained her that [name of daughter's classmate] brought the computer to school because she was dyslexic and it helped her read.

One of the parents waiting for her child to attend the workshop was a teacher, who agreed that it was important to create awareness about dyslexia. She claimed that she also contributed to it at the school. For example, she had organized a projection of the movie "Like Stars on Earth"[3]. Indeed, this movie came up quite often in discussions about raising awareness of dyslexia. The issue is that "Like Stars on Earth" is a drama film with a narrative based on the struggles and difficulties faced by a dyslexic child, which is far from the positive agenda that our design intervention tried to bring forward. This suggests that it is important to ensure that the alternative political agenda enacted by the critical design artefacts does not bring forward an equally problematic narrative.

Figure 3. "Wearable Zoo workshop" at the FabLab

The employees and volunteers at the FabLab did not have a special interest on dyslexia but embraced the agenda and enacted it in a way that would be relevant for the museum. Relying on the rhetoric of being different as something positive, they imagined the cardboard glasses as animal masks (Figure 3). However, these were a particular kind of animals, which were composed of characteristics from three different animals (e.g. pig tail, deer horns and elephant trunk). Children had a lot of fun creating and tinkering

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[3] http://www.imdb.com/title/tt0986264/

these animal forms, even though it was not clear whether any message derived from the political agenda passed to them.

In general, that the critical design artefact challenged an existing narrative and proposed an alternative political agenda was not easily recognised. For example, some people asked whether or not there exist glasses for aiding dyslexic people to read. However, once the metaphor of "*computers are for the dyslexic what glasses are for the short-sighted*" was explained, many parents could easily relate to the challenges inherent to bringing computers into the classroom. Furthermore, they found that the metaphor reflected a message that should well be passed on. For example, while one researcher was explaining that it was fine to bring the computer to the classroom, a mother turned to her dyslexic daughter and asked her "*are you listening what this lady is saying*?"

Lego bricks

This critical design artefact addresses the issue of perceiving being different as something negative, which is enhanced by the narrative of dyslexia as a disorder, by building on a metaphor that identifies dyslexic children with colourful 3D printed Lego bricks.

Design

The artefact consisted of two sets of Lego-Duplo bricks. The first set were the original bricks but painted in white. The second set consisted of 3D printed bricks, which resembled the original, colourful ones but had a main difference: three faces of the parallelepiped (instead of only two, as in the original brick) could be connected to another brick (Figure 4). This characteristic rendered these bricks unique since they allowed building more creative constructions when combined with the original pieces. The bricks were 3D printed in collaboration with the local FabLab. The idea of using white/colourful pieces of bricks was inspired by one of the slides of a presentation by Luz Rello, a post-doctoral fellow at Carnegie Mellon University who specializes in Human Computer Interaction and dyslexia [see 27]. This presentation was organized by a dyslexia association based in Madrid. In her slides, Rello depicted the data corresponding to dyslexic people as colourful while other data was shown in grey.

Intervention

Play with the bricks was enacted to create a stop-motion video. A graphic and visual designer ideated and recorded the video; a professional voice actor narrated the voiceover. To confront the narrative of *dyslexia as being a disability*, the video showed two pairs of hands playing with the colourful bricks. From the bricks were constructed words that contained spelling mistakes characteristic of dyslexic people, while the voiceover clarified that dyslexia is not a neurological condition but a different way of processing information. In addition, to reduce the *emotional load,* the hands also constructed different shapes using the grey and colourful bricks, while the voiceover explained that people

with dyslexia tended to be very creative, as they often needed to develop strategies to compensate for the challenges of reading and writing. Finally, the bricks were manipulated to create visualizations that illustrated the differences of percentages in Italy, where particular attention towards dyslexia is a recent phenomenon, as compared to United Kingdom, where dyslexia is a well-known characteristic. The stop-motion video created with the bricks was publicized on the event's Facebook page and displayed during the school and public events on a large screen, accompanied by two pairs of headphones. In addition, the bricks served as branding for the event. They were present in all the printed (e.g. leaflets, posters) and digital (e.g. press release, Facebook page) material.

Figure 4. Screenshot of the video (left) and branding (right)

Results of the intervention

The stop-video created with the bricks was published on the Facebook page of the Dyslexia Awareness Week on the 2nd of October 2015 and quickly became very popular. According to Facebook insights, an analytical tool embedded by default into Facebook pages, 91093 people played the video, 7973 people "liked" it, 4713 shared it and 351 commented on it. We could only see the comments posted on our page, yet these numbers reflect the total actions on our page and on the pages of people who shared the video. Table 3 illustrates the differences between the two of them.

Table 3 - Facebook Page data

	On our page	On shares
Likes	548	7425
Shares	4628	85
Comments	28	323

In general, people who commented on the video praised the message embedded in it, tagged other people and encouraged them to watch it. Considering the comments, most of the commenters appeared to be mothers of children

with dyslexia. One was a dyslexic person who shared her experience at the school:

"*I discovered that I am dyslexic in the 5th grade, after an endless series of failing grades in English, History and Geography… When we discovered that I was dyslexic, my classmates mocked me. They said that I was stupid or that everything was an excuse to be helped during the exams. Indeed, some of my friends stopped talking to me because, according to them, I could take the admission test to the university only because I was favoured. Indeed, they had failed all the exams; the only passing grades they had were in those subjects in which they copied. Instead, I managed to move forward always achieving 5 or 6 points and the only favour that I had was that I could use the computer and therefore do not lose some minutes, which were very useful to read the text and the questions…*" [Facebook page]

A few comments criticized the teachers and claimed that, in spite of the efforts of parents and associations, they did not apply the compensative measures during the exams. The problematic relationship between parents and teachers became evident several times during the project. One of the commenters claimed that:

 "*[…] we (the parents) need to fight against the "teachers" who do not apply the measurements during a foreign language test and, last but not least, humiliate the child with the lowest grade of the entire class.*"[Facebook page]

This was a very popular comment that received many likes from other readers. As a follow-up comment, a mother pointed out that in the case of her daughter the teachers tried their best but the problem was that they did not have the required knowledge to deal with dyslexic children. She claimed that this was due to the head of the school, who did not support teachers' training on the topic of dyslexia.

In spite of the positive message embedded in the colourful bricks, one of the mothers spotted a dissonant note in the text narrated by the over-voice. Particularly, she highlighted that the video was "*beautiful*" but "*I'd would like you not to use the term 'DIAGNOSE'. LETS USE A SYNONIM: VERIFY… CERTIFY. Diagnosis is automatically associated to a disease and this is not beneficial for our children.*" [Facebook page]

During the public event at the museum, children often played with the bricks placed on the tables. However, they did not even realise that they were different. In general, people did not ask for clarifications on the bricks. Only when the special characteristic (that of the additional play face) was brought to their attention, did they realise it and were able to find it meaningful. Interestingly, in a workshop organized in February 2016 with parents of children with dyslexia one mother showed to a researcher that she had secretly taken one of these bricks during the event and used to carry it inside the bag. This subtle, and somewhat subversive, action highlights how meaningful the proposed

alternative agenda embedded into the critical design artefact actually was.

Cooperative activism beyond the critical design project
While our critical design artefacts clearly fostered cooperative activism during our engagement with the field, it is equally important also to explore what happened after the project ended to determine if the long-term impact of the critical design artefacts was able to continually foster cooperative activism.

The group of parents of children of dyslexia with whom we interacted during the research project established a new foundation after the project referred to as the first association of parents of children with dyslexia in Trentino. Indeed, they became a formal association just before the public event at the museum. We do not claim that the design intervention facilitated the formation of this association alone. However, their decision did have timely connections with our project. It was during one of our meetings with the group that they expressed interest and decided to create the association. In addition, the core people of the association joined a two-day regional fair for children with a physical stand on dyslexia. The main foci of the fair were ludic, sport, and handcrafting activities with no explicit link to either learning or didactic activities. Still the association organized the stand also inviting our research group, a psychologist, and two logopedists to join. They explicitly asked if we could bring the "alternative lenses" with us. We found it interesting that the "alternative lenses" were able to travel to a new social world and retain their relevance in a completely different context from that in which they were originally enacted.

Finally, we are currently discussing the organization of the 2017 edition of The Dyslexia Awareness Week, which will focus on the public event. Interestingly, some of the groups that participated to the last year's edition have contacted us asking whether it would be organized again. These groups are the responsible persons for equal opportunities at our university, the group of cognitive scientists, and the association of parents with dyslexia. In particular, the association has proactively decided to lead the organization of a two-day event with similar characteristics and artefacts as the 2015 event at the museum. The willingness to lead this event and the self-organised activities which they have held throughout the year are particularly interesting because they suggest that the proposed alternative agenda was perceived as worth pursuing and replicable in different settings and forms.

DISCUSSION

We set out to create critical design artefacts, and foster cooperative activism across diverse social worlds of teachers, children, parents, experts, researchers, and the local government by enacting an alternative political agenda, pushing the dyslexia debate into new directions in Trentino, Italy. Based upon our results, we found that our

critical design artefacts (the "alternative lenses" and "Lego bricks") engaged members of these disparate worlds in an alternative dyslexia agenda by bringing in an opposing narrative. Dyslexia is addressed as a *learning difference*, as opposed the current narrative of dyslexia as a *learning disability*. Looking at these two critical design artefacts, we see obvious differences between the two of them. More importantly, these artefacts also have similarities in the way they were designed and enacted, as elaborated in the following paragraphs.

To understand the role of articulation work in the dyslexia context in Trentino it is important to highlight that no formal association advocating the alternative agenda on dyslexia existed prior to the research project. As it turned out, it could be surmised that only through the project guided by our critical design artefacts that the cooperative activism emerged and therefore, the design of the critical design artefacts influenced the emergence of cooperative activism. The two representatives of the local government had not met until we organized a meeting, and the association of parents of children with dyslexia only felt entitled to invite us to participate in their event after we organised the Dyslexia Awareness Week. The critical design artefacts were contextually bounded to a certain narrative and population – in our case the one in the Trentino region. This means that the artefacts would have been different in another context, e.g. United Kingdom, where dyslexia is a well-known characteristic and, thereby, the politics around dyslexia are probably different.

One important characteristic of our critical design artefacts was their ability to traverse different social worlds, and thereby support multiple interpretations. If we take the example where the Lego bricks travelled between events and people, we see how the bricks were able to communicate across the different social worlds, and yet remained open for interpretation. For example, the bricks became relevant within the world of children and that of their parents. For the former, the bricks represented a more versatile object of playfulness; whereas for the latter they embedded a metaphor of their dyslexic children. Interestingly, the bricks in this way resembled boundary objects [31], although not on all accounts. In comparison to boundary objects, we found that the critical design artefacts lacked self-explanatory elements, as when some parents asked whether the poster showed how their children saw written text. Indeed, this example illustrates the problem with stimulating reflection through ambiguity, since the artefacts can be interpreted as supporting the values and agendas that are actually the object of critic [3]. In our experience, the critical design artefacts could only be interpreted across different social worlds when actively mediated by people in the collective, therefore highlighting the importance of mediators in fostering cooperative activism. In our case, the researchers often played the role of mediators.

Interestingly, our artefacts did *not only* travel across different social worlds but also created dependencies across otherwise loosely coupled actors. In this context, dependencies refer to the kind of connections that are created among people through a common field of work [27]. Specifically, it was only through design practice resulting in the concrete critical design artefacts, and the enactment of these artefacts, that relations creating dependencies among actors emerged. As an example, some of the parents whose children did not yet have the "diagnosis" of dyslexia had the chance to talk with cognitive scientists who stood near the "alternative lenses". Also, the stop-motion video created with the bricks and publicized in the event's Facebook page created dependencies among different parents, who discussed and supported the proposed narrative. This intimates that the interventions were actually a process by which a new common field of work emerged. This common field of work was characterized by multiple actors enacting the alternative political agenda, which challenged the current narrative of dyslexia. In this way, we were witnessing how the critical design artefacts actually facilitated a common field of work for cooperative practices across social worlds.

Another key characteristic of the two critical design artefacts was that both were built on the assumption that people were unaware of how their perspective on dyslexia was strongly shaped by a specific dominating narrative [30]. Our critical design artefacts disrupted the social norms and thus upstaged the current narrative by means of reflection and provocation [3]; e.g. as we saw in the case of the mother who publicly challenged the use of the term "diagnose" when referring to dyslexia. It is important to note that, while artefacts in critical design often simply challenge the dominating narrative, our critical design artefacts are different since they challenge the dominating narrative, but do this *by proposing an alternative* political agenda.

By addressing this specific alternative agenda, our critical design artefacts were able to increase people's sense of agency [30]. Sense of agency refers to people's perception of their ability to bring about concrete interventions that are aligned with an alternative agenda. Indeed, our data demonstrated that people more readily decided to embrace new agendas in situations of agency. For example, embracing this agenda, the association of parents of children decided to participate in the two-day fair, which also further opened future collaborations in the project. In some cases, actors might choose not to adopt the entire agenda, but only particular elements. This situation was illustrated by the cognitive science researchers, who agreed to challenge the existing narrative of dyslexia as a disease but did not feel comfortable with the overall positive, and sometimes ludic, agenda; in their opinion being dyslexic is still a problem.

A fundamental characteristic of our critical design artefacts was that they adopted an interventionist approach, as reflected in the way in which they introduced the subject of inquiry as design practice [30]. Our design of artefacts aimed at triggering curiosity and reflection [3], with a "slight strangeness" [4]. Here it is important to distinguish between critical design artefacts and art pieces. The inspiration for critical design artefacts comes from the contextual research, interpreted by individual designer and her concerns through a particular king of *design authorship* [24], which can be understood as a *design authorship in context*. This means that, even though the design of the artefacts depends on the designer's skills and interests [3], critical design artefacts are not primarily created building on the inspiration and concerns of the designer. Instead, they are designed through building on collective concerns as articulated by the people who relate to the particular context.

CONCLUSION

Critical design artefacts are used by activists, researchers, or artists to prompt critical reflection on political contested topics (e.g. [8, 35, 2, 32]). While politics and activism both are all core interests to CSCW research, no one has yet explored the potentials of fostering cooperative activism through critical design artefacts. We extend CSCW research by introducing how critical design artefacts can foster the emergence of cooperative activism across divergent social worlds – in our case the worlds of teachers, parents, children, academics and institutions– by not only prompting critical reflections on a current narrative (dyslexia in Italy), but by providing an alternative agenda, which can serve as a nexus of cooperative engagement. The critical design artefacts thus foster a common ground through which the multitude of individuals related to dyslexia can share cooperative activism, thereby reassembling boundary objects. The critical design artefacts supported the creation of a cooperative context, which did not exist prior to SPAZIOd. Thus, we argue that critical design artefacts can serve as a vehicle to establish and maintain cooperative activism across multiple actors. The artefacts achieve this by producing a new common field of work and creating relations through the physical manifestations of the alternative agendas embedded in the critical design artefacts.

We propose that critical design artefacts have huge potentials for CSCW research dedicated to politics and cooperative activism. By unpacking the cooperative nature of critical design artefacts, we will be able to facilitate CSCW researchers' addressing of difficult political topics in new ways while encouraging development of strong interventionist research projects aimed at political activism.

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