

# Brave and Kind Superheroes – Children’s Reflections on the Design Protagonist Role

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## ABSTRACT

A design protagonist role for children has recently gained attention in political participatory design, with the aim of reframing the position of a child in relation to technology. However, the concept and the characteristics of the design protagonist remain quite vague still. We conducted a “My Superhero” design project with 13-14-year-old schoolchildren, giving them a voice, nurturing their agency, and inviting them to reflect on their design experiences and the notion of the design protagonist. The findings show the children spontaneously adopted different roles, also the design protagonist role, in the design process without us intentionally guiding them towards those. The findings reveal children’s views on the characteristics of a design protagonist and their perceptions of their own characteristics and learning within the design process. Several factors mediating children’s adoption of the protagonist role, including context, personal interest, empathy, prior joint experience, adults’ role, self-learning, and soft skills, were discovered.

## CCS CONCEPTS

• **Human-centered computing**; • **Interaction design**; • **Empirical studies in interaction design**;

## KEYWORDS

Design protagonist role, Design capital, Making, Children, Teenagers, Youth, School, Formal education, Political participatory design, Twenty-first century skills, Nexus analysis

### ACM Reference Format:

Matin Mahboob Kanafi, Netta Iivari, and Marianne Kinnula. 2022. Brave and Kind Superheroes – Children’s Reflections on the Design Protagonist Role. In *Participatory Design Conference 2022: Volume 1 (PDC 2022 Vol. 1)*, August 19–September 01, 2022, Newcastle upon Tyne, United Kingdom. ACM, New York, NY, USA, 11 pages. <https://doi.org/10.1145/3536169.3537783>

## 1 INTRODUCTION

Children are growing up in an increasingly digitalized world. Their everyday life is ever more intertwined with digital tools. Significant for the children of today is to grow to become skillful and competent users of digital technology – their future life will certainly require this. However, skills in technology use are not enough: important is

also to gain skills and competencies in design and development of digital technology. This has been the agenda of political participatory design (PD) since the early days: people’s empowerment and participation in digital technology development. PD has throughout the years underscored people’s right to affect decisions concerning their life, including those concerning technology. Moreover, PD research has emphasized the importance of equalizing power relations, striving towards more democratic practices, and giving a voice and a say to those who might otherwise be marginalized [20, 38, 49, 50].

Inspired by these ideals of the Scandinavian, political PD, Iversen and colleagues [28] have proposed the concept of a child design protagonist. This concept reframes a child’s position in relation to technology and its design, taking it beyond ‘participation’ by positioning the child as an active actor in open-ended inquiries [28]. This political PD oriented agenda foregrounds children’s critical reflection on the impacts and role of technology: children should be able to consider the implications and consequences of digital technology in their life and society (e.g., [12, 25, 28, 29]). They should be encouraged to build their understanding of technology and how they can be involved in making and shaping it (e.g., [12, 25, 28, 29]). This should result in children’s feeling of agency in their technology-rich world – so that they are not merely ‘taking part’ in technology design, but are active actors instead [11, 28, 30], acting as agents of socio-political change, in line with the PD agenda. For this to happen, children’s education needs to be reconsidered: children need to be provided with skills and competences and interest and will to make use of those (e.g., [12, 25, 28, 29]). This agenda strongly connects with PD; making this agenda possible has been even argued to be the PD community’s “task and duty” by Iivari and Kinnula [22].

This notion of the child protagonist has already received notable research interest as well as some empirical attention. However, the concept and its characteristics, although highly inspiring and valuable, still remain quite vague: there is a multitude of skills, competencies, abilities and characteristics that could be associated with ‘being a design protagonist’ (see [30]). Another yet weakly explored aspect is *which of these skills, competencies, abilities and characteristics children already possess and can be relied on in the design process, and which of them children tend to lack and need to be nurtured in children* (see [30]), which we examine in the current study. We are also advocating the perspective of children: we study *children’s views on what are the characteristics of the design protagonist and what design protagonist characteristics they consider they already possess* as so far children’s own views on this role have not been studied. This paper explores those aspects with two classes of

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*PDC 2022 Vol. 1, August 19–September 01, 2022, Newcastle upon Tyne, United Kingdom*  
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ACM ISBN 978-1-4503-9388-1/22/08.  
<https://doi.org/10.1145/3536169.3537783>

7<sup>th</sup> graders (aged 13-14), in the context of superheroes addressing bullying at school by the means of design and technology.

The paper is structured as follows. Section two discusses related research on children's role in technology design. Section three introduces our theoretical lens, while section four presents the research design, including the case examined and the procedures of data collection and analysis. Section five outlines our empirical findings while section six discusses their implications. Finally, we conclude the paper by summarizing the results and their implications and by identifying limitations and paths for future work.

## 2 FROM TECHNOLOGY USERS TO PROTAGONISTS

Hearing children's voices in issues concerning them is a long-lasting research topic within a multitude of disciplines (e.g. [5, 9, 32, 35, 44, 45, 57, 59]), among which Child-Computer Interaction (CCI) and the Participatory Design research communities have devoted specific attention to it. It is considered a valid topic for future CCI research as well [17, 18]. CCI research has for long embraced insights from the PD tradition in its quest to enable children's participation (e.g. [15]): a large part of CCI research is strongly inspired by the PD tradition and many CCI researchers have adopted the PD value basis. However, views on what this participation can mean have significantly expanded over the years. Already in 2002, Druin presented a model where children's possible roles in the design process were widened from a simple technology user towards more influential ones: a tester, an informant, and a design partner [15]. In the role of the design partner, Druin [15], inspired by the PD tradition, gives children an equal voice and a say throughout the entire design process. Since that, studies have brought forth various views on what nuances children's role in the design process can contain. For example, Barendregt et al. [4] explore these nuances in their Role Definition Matrix that helps making visible how children's roles can vary in different phases of the design process, Kinnula et al. [33] explore the roles children themselves adopt in the design process, Large et al. [35] in their Bonded Design method embrace diversity of the participants and exploit it in the design process, and van Doorn et al. [13] work together with children, offering children the role of a co-researcher. In the recently introduced political PD inspired design protagonist role [28] children are placed at the core of the design process, having a voice and a say, and engaging with real-world design problems. The protagonist role differs from the prior roles in terms of objectives, process, and outcomes, as it prioritizes child empowerment in the development of technology as well as children's critical reflection on it and children's making of more informed decisions regarding technology in their lives, aiming at increased agency of children [28].

As can be seen, a strong emphasis on the tradition of PD shows in the literature on children's participation in technology design, while some of the studies have been particularly inspired by the Scandinavian, political PD tradition. A growing body of CCI literature examines children's empowerment in relation to design and making with this inspiration ([14, 22, 28, 32, 33, 38, 48, 49, 51, 56]), calling for 'computational empowerment' of children (e.g. [12, 29]), aligning with the protagonist idea; many of the papers published in the PD Conference [14, 22, 29, 51]. After the introduction of the

protagonist role, several studies have already been conducted from that viewpoint [21–23, 29, 34, 39, 46, 56–58], highlighting the role of digital design literacy in developing children's agency and empowerment, paving the path for adopting the role of the protagonist [39]. For example, Iivari and Kinnula [22] provide an investigation into the characteristics of a child protagonist, and report that adoption of a protagonist role is challenging for children. Roumelioti et al. suggest that when adults perform as background facilitators for children in workshops, they enable children to take the protagonist role and act as independent designers in digital making [47]. Södergren and Van Mechelen present a design method for pre-schoolers to perform as a design protagonist: making their own decisions, navigating the design process, and expressing their voice in design [57]. Hartikainen et al. [21] expand the concept of a child protagonist to include an understanding of business and innovation aspects concerning technology, to increase children's agency in the future digitalization of the society. However, the literature is limited in examining exhaustively why children act differently in design and how we can facilitate children in becoming design protagonists. There is a need to explore the characteristics of a design protagonist and why inviting children to adopt this role is challenging [22, 31]. We argue that the PD community is central in this discussion due to the political nature of the child design protagonist concept.

We examine the topic in the context of prevention of bullying at school. Bullying is a vicious problem concerning us all, including children and their basic education. Hence, it is important to collaborate with children, among other stakeholders, in tackling this problem. The problem has already been addressed in CCI research with children, relying on the PD tradition (for a review, see [26]). However, such literature, even if valuable in the sense of allowing children a lot of agency to address the problem, has not explored the potential of the role of the protagonist in this context. We consider that prevention of bullying in schools and other communities where children participate is a good example of a problem children should have agency in finding solutions as it is 'their own problem' where they should have a say and where their voices are required for the solutions to be durable. Thus, we think that acting as a protagonist in tackling this problem enables children to make a valuable contribution to their lifeworld.

## 3 THEORETICAL LENS

Nexus analysis is a multidisciplinary research framework and methodology that has its roots in linguistics anthropology, discourse analytic studies, practice and activity theories, and interactional sociolinguistics [51, 52, 54]. Nexus analysis reflects on "the mapping of semiotic cycles of people, discourses, places, and mediational means involved in the social action we are studying" [53]. Nexus analysis considers social action as a central concept that is situated in the intersection of three elements: historical body of the social actors, interaction order among them, and discourses in place. The concept of historical body, coined by Nishida [42], refers to an individual's accumulated knowledge, experience, history, and background with social practices. It is closely related to Bourdieu's [6] concept of habitus but highlights the embodied elements of our experiences. The term historical body is described as a "compost heap of social practices" [52], as individuals may play the same role

differently depending on their accumulated experiences [53]. The concept of interaction order, coined by Goffman [19], stresses that social actors may behave differently depending on the social context they interact within. In nexus analysis, the concept of interaction order concentrates on the relationship and interaction among the social actors in the social situation under the study, extending from the micro interactions to wider circles of distant actors affecting what happens in situ. The concept of discourses in place stresses that the discourses are always emerging in situ, and there is a need “to study empirically which discourses are relevant or foregrounded and which discourses are irrelevant or backgrounded for the social action(s) in which we are interested” [53].

Nexus analysis has been utilized and developed within a variety of disciplines, also within computing-related ones such as in HCI and CCI (e.g. [24, 40, 43]). In this study, we consider “technology design” as the social action and 13-14-year-old children as the social actors under study. Prior studies ([40, 24]) have proposed the concepts of historical body and interaction order as valuable tools for making sense of intricate topics as they facilitate researchers to uncover historical and social aspects of the social action under study [53]. Therefore, our data analysis will investigate the interaction orders and historical bodies of the participants, and we leave discourses in place for future study.

## 4 RESEARCH DESIGN

We conducted the “My Superhero” project as a case study, “an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” [46]. The overarching aim was to engage children in the design activity to solve a real-life problem (i.e., bullying), support them in having a voice, and nurture their agency in and through design. We were particularly interested in how children themselves saw the protagonist role – what kind of characteristics they linked with it on their own, and what kind of design protagonist-related characteristics, skills, and competencies the children considered they possessed without us particularly introducing those to them.

### 4.1 “My Superhero” Project Setting

The “My Superhero” project was conducted in a local school in [anonymized] in the city of [anonymized] as a part of an information and communications technology (ICT) course with two 7<sup>th</sup> grade school classes. 43 children aged 13-14, their teacher and two researchers were involved. Permission from the school was obtained for the project as well as informed consent forms from both schoolchildren’s guardians and children themselves. The project followed the Ethics Guidelines of the [anonymized] National Agency for Research Integrity.

The children were asked to envision a superhero capable of tackling the problem of bullying through design and technology, after which the characteristics of that superhero as well as those of the children themselves were inquired. Afterwards, the children engaged in design of technology geared towards tackling the problem of bullying. In the end, children were asked to reflect on their experiences. The project took place in four 45-minute sessions for

each class (eight sessions in total) in an ICT classroom, organized into four main phases:

**Phase 1. Survey:** In the first session, we introduced to the children the researchers, the purpose, and agenda of the project. Then, we presented two short videos, one about bullying at school and another one about digital technology solutions against bullying, to introduce the main aim of the project to the children and prepare them for design and prototyping sessions. We wanted also to inquire what kind of skills and competencies the children already possess, thus we asked children to answer a 15-minute survey regarding their prior experience and background in design and making.

**Phase 2. Booklet:** We asked the children to complete a booklet prepared by the researchers. The main goal of the booklet was to make children ponder about the design protagonist role, required characteristics, skills and competencies for this role. We utilized the child-persona technique [2] for designing the booklets, as prior studies have indicated that child-created personas enable children to contribute actively [2, 3, 27, 41]. The booklet had four sections to inspect the design protagonist’s characteristics from children’s perspectives. In the first section, we asked the children to envision a superhero, who is capable of designing digital technologies to help children to prevent or stop bullying at school, and to describe the superhero’s characteristics or draw the superhero, as well as to identify the skills and competencies that this superhero is required to possess. In the second section, the children were asked to draw a comic strip to show their superheroes how bullying may happen at school. In the third section, we asked the children to imagine that their superheroes design digital technology to help children to solve the problem of bullying at school. The children were asked to do it on behalf of their superheroes and draw their solutions in the form of digital technology in the booklets. Finally, in the last section, we asked several questions concerning the superhero and the children themselves, for example, what kind of skills and characteristics of their superheroes they already have themselves or wish to have. The booklets were completed by the end of session two.

**Phase 3. Design and Prototyping:** In the last two sessions, the children were invited to take part in prototyping sessions. The overarching aim was to inquire about children’s spontaneous actions during the prototyping sessions and realize what skills, perceptions, and reflective stances toward technology the children already possess or gain through prototyping sessions. Besides, we were interested in how the children perceive themselves in the design process and whether they engage in leading a design session. We provided various materials including Lego, Lego WeDo 2.0, tablets, e-Textile kit, Lily pads, felt, cardboard, etc. and support for the process. In addition, laptops were already available in the ICT class for each student. The children were free to choose their favorite materials for prototyping their design ideas from their booklets or even generate a new idea to design a digital technology for solving bullying at school. They were allowed to form groups or do the prototyping individually. At the end of session four, each group presented their design and digital technology solutions to researchers.

**Phase 4. Reflection:** After the project, the children were asked to complete a reflection paper including ten questions regarding

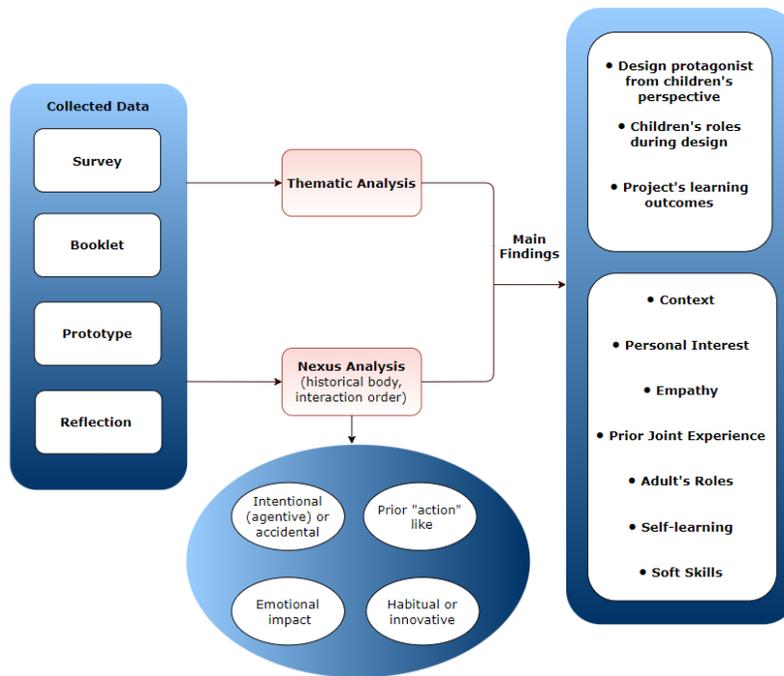


Figure 1: Flow diagram of the data analysis process

their critical reflections on this project as their homework. The reflection papers were collected from children a week later.

#### 4.2 Data Collection and Analysis

Data was collected with various methods, including the background survey, booklet, reflection paper, video recordings from the four sessions, children’s presentations, interview with the teacher, observation, and field notes of one of the researchers. From the point of view of this analysis, the most significant data is the written materials (42 surveys, 42 booklets, and 33 reflection papers) and video data from the sessions.

In the first step of data analysis, we employed tables to organize the data from the surveys, booklets, reflection papers and transcriptions of children’s presentations, and utilized NVivo for coding and generating themes for thematic analysis [7]. Following the field guide [52], we mapped semiotic cycles of participants and inquired about histories and historical body of the participants with the social action (particularly, how habitual or innovative the action-practice is, how intentional (agentive) or accidental the action-practice is, when and where the last prior ‘like’ action is, and the emotional valence or emotional impact on the participants), the interaction orders among them while the social actions occur (e.g., their conversations with each other, teacher, and researchers) and the history of interaction orders and mediational means for children. For this purpose, we assessed the surveys, booklets, and reflection papers to discover children’s background and prior experience and how children critically reflected on technology design. Next, the video recordings and field notes were analyzed to inquire about children’s actual work and interactions during the prototyping sessions, comparing them with the children’s written materials.

Finally, the findings were discussed among researchers to reach a shared understanding. Figure 1 describes the data analysis process.

### 5 FINDINGS

In this section, we first present characteristics of the design protagonist from the children’s perspective. Second, the designs children created for preventing bullying are presented. Third, children’s reflections on the learning outcomes of the project are discussed. Fourth, we examine the design process in detail and discuss the roles children adopted during the design sessions, arguing that some of them adopted the role of the design protagonist. Finally, we report findings on children’s interaction orders and historical bodies intermingled in their design activity as well as factors mediating children to adopt the protagonist role.

#### 5.1 Design Protagonist Characteristics from Children’s Perspectives

In the booklets, the children were asked to envision a superhero capable of designing digital technology to help children to solve the problem of bullying at school. We were interested to investigate through children’s perspective, what characteristics, skills, and competencies a design protagonist is seen to possess. In order to inspire the children to do the task, they were free to consider any character as their superheroes that they were interested in, either human or animal. The children were asked to describe or draw their superheroes and express all of his/her characteristic and design-related skills. We received many powerful superheroes in children’s booklets, while most of them were from their historical bodies



Figure 2: Children’s superheroes and his/her characteristics and skills

relevant to animated movies (Figure 2). As an example, Alice<sup>1</sup> wrote: “My superhero is “Dino-daisy. . . she is experienced, wise, playful, kind, friendly, smart, determined, resilient”. (Figure 2, pic A)

We visualized the skills and characteristics based on their frequencies with a word cloud (pic B) in Figure 2. The figure indicates that being “Brave”, “Smart”, “Independent”, “Creative”, and “Kind” are the most prominent attributes of a design protagonist from children’s perspectives. We categorized the characteristics and skills (cf. [55]) into four categories: 1) **personal traits/attitudes** (brave, smart, kind, fast, strong, happy, wise, friendly, cheerful, funny, hero, risk-taker, soul-lifting, sassy, determined, resilient, stubborn, selfless, cool, compassionate, understanding, loyal, positive, patient), 2) **social and communication skills** (helpful, social skills, caring, team-work skills, presentation skills), 3) **management and leadership skills** (independent, leader), 4) **analytical skills** (problem-solving, thinking skills, critical thinking), 5) **creativity skills** (creative), and 6) **technical skills** (coding skills, programming skills, digital skills, electronics knowledge, computer skills). Although children were asked to envision a superhero who is capable of designing digital technology to solve problems, it seems that children were inspired by the topic of the project (i.e., bullying) in describing their superheroes’ characteristics and skills. Besides technical skills, it was interesting that children mentioned a wide range of personal traits for a design protagonist. It is not only that the superheroes are brave and smart, but they are also kind and compassionate persons, as well as happy ones!

## 5.2 Children’s Designs for Preventing Bullying

We received diverse designs for preventing bullying at school. The solutions were at different levels, and we were astonished to receive a couple of very advanced prototypes created by the children. Two games were developed by two groups; the game “God Is Watching” and the game “Scape the Bully”. In the game “God Is Watching” the game player should try to stop other children from punching each other, otherwise, if a child gets punched a Flying Spaghetti Monster gets angry and the game will end and show this message

“You upset the Flying Spaghetti Monster and caused him to end reality. It is all YOUR fault because you bullied, don’t bully”. In the game “Scape the Bully”, the bully punches other children and the game player should try to escape the bully, stop him and defeat him with a sword, otherwise the game will end. Another astonishing design was from a group called “BIX”, which was designed for informing children about LGBTQIA communities. A child in this group was determined to design something to help children with different gender identities not become victims of bullying. She said: “This is BIX...an app where you can learn all about different gender identities and sexualities it’s important to understand these things, so BIX has taps and exercises for all different ages. BIX is free and easy to use.” We also received several apps and blogs for preventing bullying where children can report when they are being bullied or write about annoying behaviors at school and ask for help or support from adults or other children. In addition, several robots were designed for stopping bullying. For example, group “Therapy Bot” designed a portable robot that walks around the school and tries to talk and displays nice messages to children who are being bullied or even talk to the bullies to convince them to be a better person. A “Bot Bot” robot was another robot designed for stopping bullying with a jail on its back for imprisoning the bully. Furthermore, a “Fredrik” robot chases the bully, has a camera on it, and reports the bully’s behavior to teachers. Another interesting design was a digital carrot badge which was designed by e-textiles, has a sensor, and if it spots bullying it sends a message to the teacher. In addition, we received two digital pens for reporting bullying, digital tokens for encouraging children to behave friendly at school, and several cars designed by Lego to chase the bully.

## 5.3 Children’s Reflections on the Learning Outcomes

In their reflection papers, children reported a wide range of skills, knowledge, and attitudes that they gained or developed through their engagement with “My superhero” project (Figure 3).

The majority of the children stated that bullying prevention was the most important learning outcome (15%), while creativity

<sup>1</sup>Children’s names have been changed due to anonymization purposes.

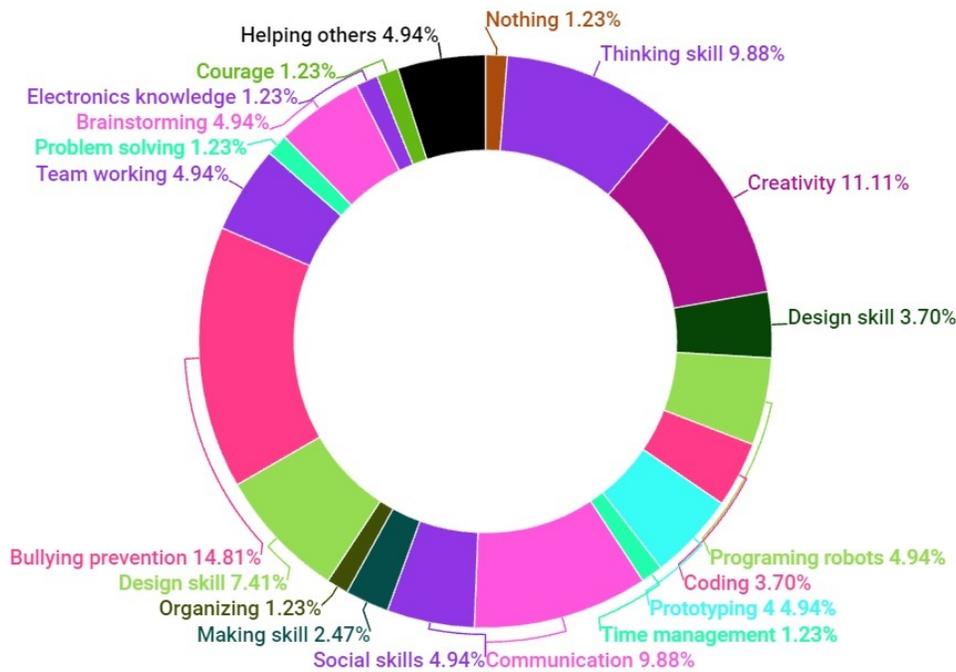


Figure 3: Learning outcomes of the project from children’s perspectives

was considered as the second most important (11%). Communication and thinking skills were the third most important learning outcomes (20% together). Besides, design skills, prototyping skills, social skills, teamwork, programming robots, brainstorming, and helping others were among the most noticed learning outcomes. One of the students stated that he learnt nothing new in this project.

We categorized the learning outcomes of the project (cf. [55]) and found those entailing: 1) personal traits/attitudes (courage), 2) social and communication skills (bullying prevention, communication, teamwork, helping others, social skills), 3) management and leadership skills (time management, organizing skills), 4) analytical skills (thinking skills, problem-solving), 5) creativity skills (creativity, design skills, making skills, brainstorming) and 6) technical skills (programming robots, prototyping, coding skills, electronics knowledge).

### 5.4 Children’s Roles During Design

In our analysis, we used Iversen et al.’s [28] characteristics for design protagonists: children act as key agents driving the design process, gain new perceptions toward design and technology and critically reflect on digital technology in their life. The children participating in our study could be categorized into four groups:

**Group 1. Design Protagonists.** We could identify several design protagonists in the classes: they carried out all the phases of design from ideation to actual prototype design, led the groupwork or did the prototyping individually and did their work independently from teachers and researchers. Furthermore, they achieved

new insights towards digital technology design and had critical reflections related to that. Children in this group were self-confident, they even considered themselves as superheroes in their booklets. For example, Ella who acted as the leader of her group wrote: “*I guess I was born with them [characteristics and abilities], [I need] nothing more I am perfect as I am!*”. Similarly, Alice mentioned: “*I have the same skills as Toby*” [my superhero]. However, some of the children in this group were less confident in their skills and mentioned that they need to improve their skills to reach their superhero’s advanced level. For example, Sarah who was the leader of her group wrote: “*I would like to be more creative like BIX [my superhero] . . . BIX was born with these skills*”. Moreover, Carlos wrote: “*I would like to get better at programming*” [like my superhero]. In this group, children mentioned that they gained new perceptions of digital technology design and had critical reflections toward technology in their lives, for example, Alice stated: “*In my eyes, technology is a creation to help solve a minor or major problem. Many people’s jobs are helped by technology. . . some technologies can be harmful or at least have cons. . . [this project] helped me understand the creative process that goes into making an app.*” Similarly, Carlos wrote: “*Technology solves many problems around the world. . . [but] technology can be used to track or censor people*”.

**Group 2. Ideators.** Ideators are children who did not adopt the protagonist role but worked considerably in some design activities. They acted remarkably in the drawing sessions individually; they had great design ideas, but they could not conduct the prototyping sessions. It seemed that they might not have felt confident enough to express their design ideas to their group members and to lead the prototyping sessions. If there was a protagonist in their team,

the Ideators let the protagonist lead the prototyping sessions. For example, although Julia did an admirable job in designing an app and a logo for her app to stop bullying, in prototyping sessions, she couldn’t lead the group and suggest her idea to her teammates. She mentioned in her booklet she lacks communication and social skills: “I would want to be a more social person so I could interact and talk with other ones more”. Similarly, Clara stated: I would like “to learn social skills”. Children in this group stated they gained new insights into digital technology design and had critical reflections toward technology in their lives. For example, Julia wrote: “Technology is good because you can design things that can be helpful for your life and others. You can also use technology to keep in touch with people you know . . . Technology can be bad sometimes as you have the chance of getting bullied (e.g. if you use social media like Snapchat, Instagram)”. Clara mentioned: “By technology you can learn and see new things, for example, Media, also doing coding. . . bad things in technology is like bullying and it can be confusing. . . [In this project] I learned how to design and create new things and prototypes and I advanced in my communication skills”.

**Group 3. Complainers.** The tasks were challenging for this group, they had problems in ideation and prototyping without help of the teacher or researchers, but they were interested to participate and finalize their work. They constantly complained about creating the fictional superhero, the design task, and prototyping, they asked several questions from the teacher and researchers; however, their contributions were still significant. As an example, Rosa mentioned in her reflection paper that “I think that this project was a bit challenging . . . I will try to utilize the skills that I learned as I get older in daily life when facing problems to help me and others”. Children in this group mentioned the importance of social and communication skills. For example, Zoey wrote that she would like to have “social and communicating skills” like her superhero. Similarly, children in this group stated that they gained new insights about digital technology design, and they had critical reflections toward technology in their lives. For example, Rosa stated that “Technology can help a lot in everyday life and it can make things easier to do. With phones you can also communicate with friends and family. . . new technology e.g robots can make it so that some people lose their jobs... phones can also be dangerous if you for example communicate with dangerous people. . . I think that the most important thing I learned (in this project) was creative thinking since I was able to look at a problem (bullying) and create something creative to solve that problem”.

**Group 4. Disinterested.** Only a few children were positioned in this group: children who were not interested or were only partially interested to participate. Some children were interested in the beginning but did not finalize their works. For example, during completing the booklets, some compared their drawing or design with their friends and considered they were not good enough, stopped completing their booklets and only partially participated in teamwork. In this group, children did not have positive reflections toward the project, and they did not critically reflect on technology in their lives. For example, Simon wrote: “I’m sorry but I do not have any of them” [my superhero’s characteristics and skills] . . . personally, I am not interested in ICT, so I did not have interest from the start of the project, I like reality more than the computer and coding world. . . I would not like to do similar projects again and do not need the skills I learnt in this project”. Also, Ronald wrote: “none

of them” [I have none of my superhero’s characteristics and skills] . . . I wouldn’t like it (the project) because there are other more fun things to do. . . technology makes things easier. . . [but] making technology is bad”. Besides, Mario indicated his lack of interest: “I have none of them [skills] because I am a useless without a skill person. . . I would not like to do similar projects.”

## 5.5 Interaction Orders and Historical Bodies Intertwined in Design

We also examined the research material through nexus analytic lens. Several factors were uncovered that can mediate children’s agency within design activities. Before the project, we discussed the project’s purpose, agenda, and timetable with the teacher. The teacher was an ICT teacher and was interested in the project. Consequently, the “My Superhero” project was conducted in a **formal setting**: it was prearranged, structured as a compulsory task for children at school, and the teacher informed children that their written materials and prototyping will be evaluated [16]. We benefited from the formal context as the majority of the children committedly participated in the project.

The data revealed that the participants had many shared historical body and interaction order related aspects. They knew each other as they were classmates and they had equal access to the materials and equipment provided by the school. The participants had similar prior experiences with materials such as Lego, wood, clay, paper, puzzle-liked toy, yarn or thread, playdough, laptops etc., and they engaged in using them during the crafts, ICT, and math courses. Furthermore, they were familiar and had experience of coding in math courses. Besides, there were several signs of a shared media and technology landscape, with mentions of Khan Academy and Scratch (in math lesson), YouTube, and different digital (design) tools such as Canva, Photoshop, Paint 3D, Unity, Visual Studio, and Roblox Studio. In addition, all participants had prior experience of working with electronics, programming, coding, and robotics at school (during crafts, ICT, and math lessons), and some of them had the experience of participating in FabLab workshops and using 3D printers and laser cutters. The analysis indicates that design activities have been internalized as a “practice” in children rather than being solely an accidental action.

The data analysis also revealed the significant role of **personal interests**; children were more dedicatedly engaged in the design when they confronted a **real-life problem**, either personal or societal (i.e., bullying). For example, Sarah was determined to design an app to increase awareness regarding different gender identities among children: “It’s an app to teach young children about the LGBTQIA communities, because I noticed that a lot of people even in our ages lack knowledge about everything and I think it is a pretty important topic and I thought maybe if we teach them already at a young age to know . . . It’s ok to be different, so if they just knew more, they would not bully those who do not fit to kind of to a normative world”. Similarly, Ivan mentioned that: “I would like to have a product that can create world peace. I believe it would be an important topic. . . I think my interest in creating a product to help a real-life problem has increased”. Thus, we argue that addressing personal or societal problems through design activities persuades children to play a

key role and facilitates them to develop a better understanding and ability to create solutions.

Additionally, we comprehended that the topic of our project (i.e., bullying at school) had **emotional valence or impact** on the children. Our results revealed that children can be more persuaded to engage in design process as main agents when they realized that they could show their **empathy**, develop a deeper understanding of other children who are victimized (i.e. being bullied) and empathize with them through their designs. For example, Alice mentioned: *“being able to help/stop bullying are the most important skills because creativity helps you and you can create new things easily and helping bullying is very important so that no one is sad.”* Similarly, Sarah wrote: *“I would maybe like to do something similar later to help people/children understand the LGBTQIA community. . . I can help people to be better allies.”*

We also examined the actual work of the children and their interaction orders in group work during design and prototyping sessions. The children were interacting with each other (within their group or other groups), their teacher, and researchers. In groups, children were discussing what their superheroes, stories and ideas were and what ideas would be the best for prototyping. Some of the children were individuals who prototyped their ideas independently. We were interested to investigate the history of this interaction order for children, similarly to Scollon and Scollon’s [53] example; *“Do they often go shopping together or is this the first time?”* The findings from the survey imply that children had had design activities together prior to this project, for example, Manon wrote: *“In school, I learned [the skills] with my friends during lesson. . . [from] my crafts teacher”*. In addition, during the prototyping sessions, when the teachers decided to form the groups, the children insisted that they would like to form their group and work with their friends, indicating how children organize themselves for social interaction within the scene [53]. For instance, a group of children who knew each other and had **prior joint experience** (practice) in coding, immediately shaped a group together and started to brainstorm, prototype, and finalized their prototype within two sessions.

Prior studies ([40, 43, 14]) have indicated the impact of **adults’ role** in terms of “multiple voices” [40] or “hidden participants/supporting roles” [53] in children’s design and making activities. In this study, the teacher was responsible for the ICT courses which indicates common histories between children and her during the ICT course. The interactions between the teacher and children were foregrounded as many children clearly felt more comfortable e.g., asking questions from their teacher (compared to researchers) due to the common historical body and interaction orders between them. The teacher contributed to the formulation of interaction orders between students, and students and researchers, and constantly guided children to critically think and broaden their minds during the design and prototyping sessions. For example, the teacher emphasized to the children that *“write as descriptive as you can”* in written materials. Thus, we argue that the teacher can have a considerable impact on stimulating and navigating children toward the adoption of the design protagonist role. Furthermore, several traces of parents and siblings’ historical bodies were discovered. Many children wrote in their surveys that they had engaged in design activities with their parents. For example, Ella mentioned *“our school teacher and my family, so my mom and dad taught me”*.

However, our data analysis highlights **self-learning** among the design protagonists of this project: they mostly considered themselves as self-learned persons. They highlighted their roles in gaining various skills and competencies in their surveys and booklets. For example, Jonas stated: *“I taught myself and . . . [I learned the skills by] myself and googling it”*. The findings indicate that various factors mediate the adoption of the protagonist role, and these also vary between children.

## 6 DISCUSSION

This paper was set to examine the characteristics of the design protagonist from the perspective of how children characterize the role/mindset and what kind of design protagonist characteristics children possess without us introducing them to the process. We claim several children we worked with can be characterized as design protagonists: they possessed many important characteristics, although not necessarily all of them. We contribute to CCI and PD research by extending our understanding of the characteristics related to the political PD oriented concept of the design protagonist, particularly from two perspectives: 1) Previous research has taken an adult perspective towards what kind of characteristics can be linked with the design protagonist concept, whereas we make visible novel characteristics children link with it, not yet explicitly discussed in the literature. 2) We bring forth a variety of elements that mediate children’s agency in the design process, linking them to the design protagonist concept. We maintain there is more variety in the characteristics of the design protagonist than currently acknowledged in the literature.

### 6.1 Characteristics Children Associate with the Design Protagonist

Previous studies have linked certain characteristics with the design protagonist role ([21, 22, 28, 39, 55]), often referring to e.g. the 21<sup>st</sup>-century skills [1] as one basis for the characteristics. In this study, we contribute by inquiring what children themselves link with protagonist mindset, i.e., we integrate children’s voices into the academic discourse on the matter. The children identified various social and communication skills, management and leadership related skills, analytical skills, creativity skills and technical skills for the protagonists. What is significantly different compared to the characteristics listed by adults in previous research is that the children associated many personal traits/attitudes with protagonists (Figure 2, pic B). We found it fascinating that the children considered that a protagonist should be e.g., compassionate, friendly, and happy, not only having a certain skillset. Some of the characteristics the children mention can be explained with the context: a superhero needs to be brave and independent to be able to make a change in the world, i.e., stop bullying. But making a change is also in the center of the protagonist mindset and braveness is surely needed for that. We think that these wise words of children should be considered carefully, asking what elements it is possible to add in the design and making process to support children to grow to be brave, kind, wise and soul-lifting protagonists. Moreover, we argue PD researchers should consider also adult actors as potentially, even preferably, adopting this role. We should be considering how can we encourage adults to become agents of socio-political change and

to act as brave and soul-lifting design protagonists as well, who use design and technology for making the world a better place.

We also propose that future research asks children to reflect on what kind of characteristics they associate with the central actors, products, or services in their designs, and how these characteristics reflect in children themselves or their lives. This has a two-fold aim: it helps adults to understand children’s lifeworld better, but it also gives children a chance to reflect on their values and how those are associated with their designs, making it visible for children that various values are embodied in technology design. Such a practice could enrich the PD community’s understanding of ‘designing between’: between digital and physical, some of the children naturally moving between these two worlds; and between children and adults, particularly when listening carefully to how children understand their own lifeworld, without adults interfering. We argue that by including children’s perspective into design protagonist concept, we are indeed “designing between” – as the notion of the protagonist is originally something created *by* adults *for* children, while we advocate adults asking and very carefully listening to children’s thoughts on what it really means to be a protagonist.

## 6.2 Protagonists or Indifferent – Varying Skills and Attitudes

Our findings indicate that in a regular classroom in a country with high education standards, children with a similar background in technology and design education can act quite differently within a design activity. We maintain some children acted as design protagonists and they did so without any particular support from us. All children were encouraged to reflect on the notion of the design protagonist in their booklets and all received support for their design activities, while some of them possessed quite advanced skills in design and programming, took a lead, guided their group, and showed strong interest and ability to utilize design and technology for making the world a better place. We showed these children were driven by personal interests as well as by an interest to address significant real-world problems. They showed empathy towards those marginalized and wanted to take action to make a change for the better. They also showed the ability to reflect on technology, also critically. We are happy to identify such a group of children in these 7<sup>th</sup>-grade classes; they seem to possess the design protagonist characteristics without any intervention from us. Some of them also critically reflected on their skills and abilities and pointed out targets for improvement. We see such critical reflection as a part of the protagonist’s characteristics, indicating these individuals’ ability to approach the world critically, including the self, and a will for continuous improvement. However, we also underscore the importance of paying attention to the other child groups we identified as well: the Ideators, Complainers and Disinterested. They cannot be considered to be design protagonists for different reasons: they lacked technical, social and communication, management and leadership or creative skills, among others.

These findings have interesting implications for CCI and PD research interested in the design protagonist concept ([14, 21, 22, 28, 29, 39, 51, 55]). We argue the categorization of skills and characteristics we identified acts as a useful basis for the further specification

of the design protagonist role, in addition to the skills and characteristics proposed by children for their superheroes (section 5.1). Our findings indicate researchers should be considering the children they work with and their needs and characteristics carefully. We should be inquiring whether the children we are working with are self-learned or natural design protagonists, who just need a small push or trigger towards the right direction. However, for sure not all children will possess these skills and characteristics to begin with and these children should gain most of our attention. We should carefully consider what kind of help and support we could provide for them: whether they need help in design and technical skills or whether they should be helped in terms of social, management, analytical or leadership skills. For some of these skills, CCI or PD researchers are by no means experts and multidisciplinary collaboration is needed. Teachers are one valuable resource for that, if working in schools. In addition to the different skills, we should also consider personal characteristics and attitudes. We need to pay attention to the complainers and disinterested in particular: what kind of support or encouragement they may need. Though we do not think every single individual in the world should become a design protagonist, there might be a lack of knowledge or misunderstandings, bias, and prejudice making some children disinterested or disengaged. In such cases, we should try to change the situation. We should also consider these characteristics in relation to adult participants: we are certain one can identify adult design protagonists in PD projects, but there might also be ideators, complainers and disinterested as well, and we should try our best to engage them, too.

## 7 CONCLUSION

In this paper, we thoroughly explored skills and characteristics associated with the design protagonist role from children’s perspectives and uncovered new angles toward this role. Besides technical skills, children brought forth the virtues of character, which perspective has been so far neglected: as a protagonist who changes the world, children underscored you need to be also a kind and compassionate person. Additionally, we highlighted several elements mediating children’s agency in design, including context, personal interest, empathy, prior joint experience, adults’ role, self-learning, and soft skills, implying that there is no one-and-only approach to become a protagonist. Our nexus analytic inquiry made visible many contextual factors: it is not only particular children with particular skills and characteristics who affect the events, but the context with many historical and social trajectories is shaping what is happening [53]. The context of school and the presence of the teacher, children’s shared experiences in the classroom and beyond, their shared knowledge base in terms of different literacies, their personal histories and interest are all intermingled. No matter how carefully we plan our projects, such historical and social factors are shaping both the process and the outcomes. Educating future design protagonists always takes place in a context that is influencing what kind of design protagonists are emerging along the way. It is also worth asking what kind of effect the cultural context has on children’s work and adoption of different roles. This is also a limitation to our study: we examined the phenomenon in a particular cultural context, school, and group of children. Should we expect or even

aim for child design protagonists to have similar characteristics all around the world? This is a question for future research.

The “My Superhero” project indicates that participatory design embraces children’s cosmologies by leading them to investigate a real-life problem and provide solutions for that from their perspectives. We think that the project context – stopping bullying – was a good choice. The problem belongs to children’s lifeworld, it’s a real-life problem for them and children have an emotional link to it. Thus, the problem is personally relevant, motivating and engaging children. We concur with previous research that urges researchers and practitioners to give children the possibility to choose the topics based on their interests [8, 10, 36, 37]. For the ones particularly aiming at increasing children’s agency, i.e., their protagonist mindset, we suggest asking children what they see as important and central issues to handle in their lifeworld, and base the projects on those topics, to try to ensure children’s emotional link and through that also engagement. Considering the conference topic of embracing cosmologies, we also think children of today are highly engaged and eager to protect and cater for the planet Earth, considering the ecological dimension in particular. The design protagonist mindset would enable them to take action to address this important topic through design and technology.

The COVID-19 pandemic restrictions limited our access to the school and children, with restraints to the project’s sessions; hence, careful planning with school guidelines was needed. Children’s motivation to participate in design activities was another limitation; nonetheless, as the project was carried out as a part of their ICT course, the majority of children actively participated in the project.

## ACKNOWLEDGMENTS

This study was funded by Academy of Finland (Grant #324685, Make-a-Difference project). This research is connected to the GenZ project, a strategic profiling project in human sciences at the University of Oulu, supported by the Academy of Finland (Grant #318930) and the University of Oulu.

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